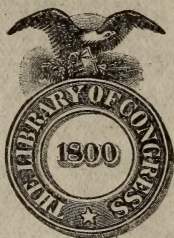


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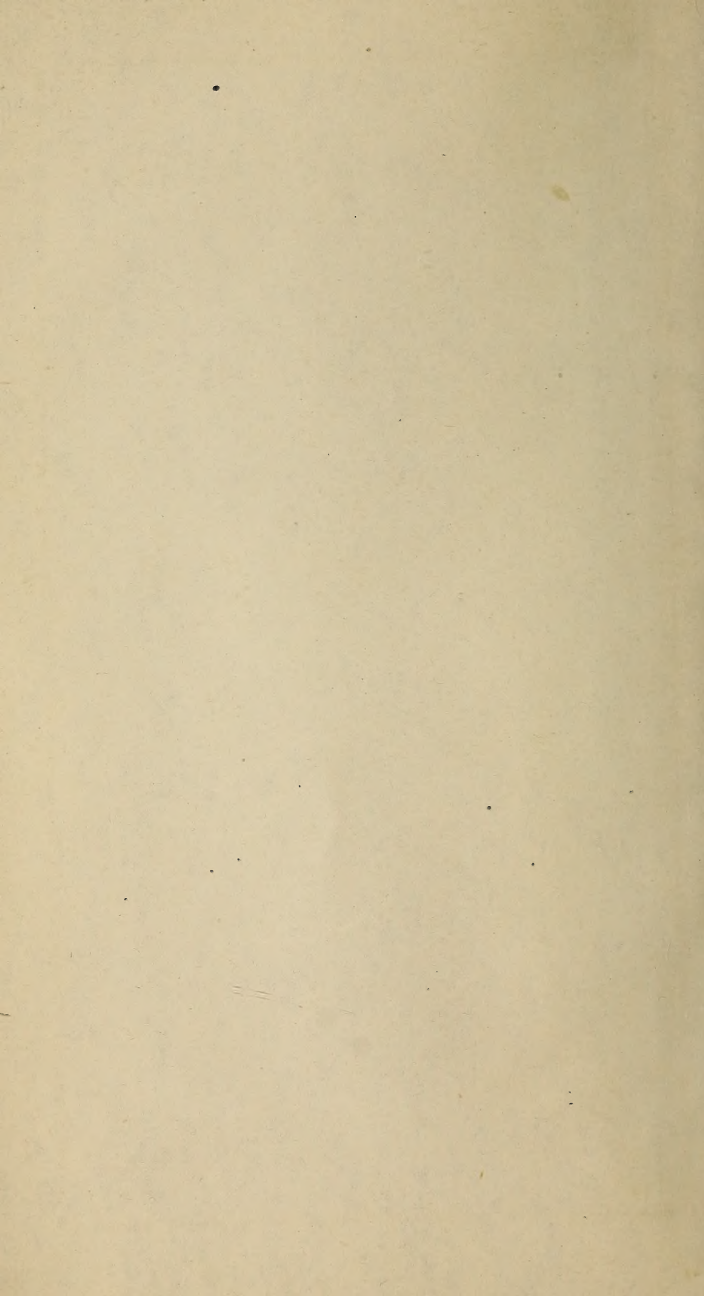
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# Handbook of Therapy

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CHICAGO

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*SIXTH EDITION*

*REVISED AND ENLARGED*

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1920

AMERICAN MEDICAL ASSOCIATION  
635 NORTH DEARBORN STREET, CHICAGO



Handbook of Therapy

RM 126  
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OCT -6 1920

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## PREFACE

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The sixth edition of this handbook is necessitated by material changes in our knowledge of the etiology and pathology of many diseases as well as in our knowledge of the actions of drugs. Many articles have been entirely rewritten, notably those on influenza and pneumonia. Several subjects allied to therapy have been omitted to make space for an enlarged discussion of some diseases and for the insertion of new articles. The objective has been constantly kept in mind of a small handbook that shall suggest an up-to-date treatment for the diseases considered.

OLIVER T. OSBORNE, M.D.  
MORRIS FISHBEIN, M.D.

October, 1920.





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# PREScription WRITING

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## INTRODUCTION

Correct prescription writing is such a close corollary to good therapeutics that it seems pertinent to introduce it in this book. Although some of the material which appears in this and subsequent chapters may seem elementary, it is hoped that the physician who reads it will pardon such detail in order that the subject may be presented entire.

Therapeutics is the ultimate aim of the science and practice of medicine. It includes not only drug therapy, to which its definition is so often erroneously limited, but also everything that has to do with the treatment of disease, the management of the patient, his convalescence, his permanent return to health, and the protection of the well against disease.

## THE MANAGEMENT OF DISEASE

The administration of drugs is only a small part of the successful management of disease. Successful management demands all the physiologic, chemical, anatomic, pathologic, bacteriologic and pharmacologic knowledge that can be obtained. It includes necessary hygienic changes, perhaps a change of climate, an arrangement of the food and drink, physical treatment if indicated, such mental treatment as is advisable, such medicinal treatment as is needed, and necessary operative procedures. Altogether this is therapeutics. The subject of therapeutics is, then, the broadest and the hardest one for the medical student to grasp, and it is safe to say that the young graduate in medicine, even after a hospital course, is less prepared in the bedside and office management of disease than in any other branch of his art.

## PSYCHOTHERAPY

A proper understanding of the ability of the mind to overcome many nervous disorders, to prevent the misinterpretation of, and the exaggeration of, slight physical disturbances should be encouraged. Rational thera-

peutics does not limit the physician to any one form of treatment ; it encourages him to use every means which may benefit his patient.

#### PRESCRIBING PROPRIETARIES

While simplicity in prescription-writing is advisable, the art of combining drugs or of rendering a drug less disagreeable should be studied and practiced until efficiency is secured. It is not justifiable for a physician to belittle his profession and forget rationality in his treatment of a patient by ordering secret or irrational proprietary mixtures. The physician who orders such preparations does not realize the positive harm he often does his patients, in some instances almost amounting to criminal negligence. No one deems it reputable, or scientific, or just to patients to prescribe preparations the ingredients of which he does not know.

#### PHARMACOPEIA AND NATIONAL FORMULARY

Few physicians know the range and compass of these books. No sane person would advocate using all of the heterogeneous mass of preparations included in them, but every physician can select the few formulas he may need that will be as elegant and pleasant methods of giving drugs as proprietary preparations and, moreover, will represent guaranteed doses of the various ingredients of the formulas selected. While the use of some of the ready made preparations is advised, it should be understood that it is much better to combine one's own prescription to fit the individual case.

#### "USEFUL DRUGS"

This is a book describing the action and use of drugs that have positive therapeutic value ; it is prepared under the direction and supervision of the Council on Pharmacy and Chemistry of the American Medical Association. It is intended to meet the demand for a less extensive materia medica and especially to serve as a basis for the teaching of materia medica and therapeutics and for examinations on these subjects by state licensing boards. It contains an especially

selected list of valuable preparations, picked from the vast number included in the Pharmacopeia, National Formulary and New and Nonofficial Remedies.

#### NEW AND NONOFFICIAL REMEDIES

The physician should be ever ready to make use of a valuable discovery, but never to further fraud. A new drug should be ordered straight or used only in our own combinations. New and Nonofficial Remedies is a book containing a list of new remedies, not in the Pharmacopeia, with a description of their preparation, their action and dosage. It is issued annually under the direction of the Council on Pharmacy and Chemistry. It enables the physician to know what proprietary preparations are reliable.

#### OFFICIAL PREPARATIONS AND USEFUL DRUGS

The principal preparations of the United States Pharmacopeia may be classified as follows:

1. Solids mostly for internal use:
  - A. Extracts (*extracta*).
  - B. Pills (*pilulæ*).
  - C. Powders (*pulveres*).
2. Liquids mostly for internal use:
  - A. Waters (*aquæ*).
  - B. Elixirs (*elixira*).
  - C. Emulsions (*emulsa*).
  - D. Fluidextracts (*fluidextracta*).
  - E. Infusions (*infusa*).
  - F. Liquors (*liquores*).
  - G. Mixtures (*misturæ*).
  - H. Spirits (*spiritus*).
  - I. Syrups (*syrupi*).
  - J. Tinctures (*tincturæ*).
3. Semisolids for external use:
  - A. Cerates (*cerata*).
  - B. Ointments (*unguenta*).
4. Liquids for external use:
  - A. Liniments (*linimenta*).
  - B. Some waters (*aquæ*).
  - C. Some liquors (*liquores*).
  - D. Some tinctures (*tincturæ*).



### 1. Solids Mostly for Internal Use

A. *Extracts* are concentrated preparations of a drug, and are mostly moist and sticky. A few extracts are dry. They should be prescribed in pill or capsule. Extracts are usually four times the strength of the drug.

The most important are:

Extractum belladonnæ foliorum	Dose, 0.015 gm. or gr. $\frac{1}{4}$
Extractum cascaræ sagradæ	Dose, 0.25 gm. or gr. iv
Extractum fellis bovis	Dose, 0.1 gm. or gr. iss
Extractum opii	Dose, 0.03 gm. or gr. $\frac{1}{2}$

B. Official *pills* are ready-made preparations, and consequently it should be remembered that they may have deteriorated or become more or less insoluble.

The following pills have been much used.

Blaud's pills (pilulæ ferri carbonatis) contain 0.065 gm. (1 gr.) of iron. Should be made fresh when wanted. Dose, 2 pills.

Pills of aloes (pilulæ aloes) contain 0.13 gm. (2 gr.) of aloes. Dose, 2 pills.

Compound rhubarb pills (pilulæ rhei compositæ) contain rhubarb 0.13 gm. (2 gr.); aloes 0.10 gm. ( $1\frac{1}{2}$  gr.); myrrh 0.06 gm. (1 gr.). Dose, 1 or 2 pills.

C. Official *powders* are dry preparations of two or more drugs. It is better to order a powder by its official title, but below are the common names and the ingredients of the most used of these preparations:

Dover's powder (pulvis ipecacuanhæ et opii) contains 10 per cent. each of ipecac and opium. Dose, 0.5 gm. (or gr. viii).

Compound jalap powder (pulvis jalapæ compositus) contains 35 per cent. of jalap and 65 per cent. of potassium bitartrate. Dose, 2 gm. (or gr. xxx).

Compound licorice powder (pulvis glycyrrhizæ compositus) contains 18 per cent. of senna; 23 per cent. of glycyrrhiza; 8 per cent. of sulphur. Dose, 4 gm. (or  $\text{ʒi}$ ).

Seidlitz powder (pulvis effervescens compositus) consists of two powders; one of Rochelle salt and bicarbonate of soda in blue paper, and the other of tartaric acid in white paper. Dose, the contents of one white and one blue paper dissolved in a glass of water.

## 2. Liquids Mostly for Internal Use

A. *Waters* are solutions of *volatile* substances in *water*; mostly *weak* preparations. (Exception, ammonia waters.)

H. *Spirits* are solutions of *volatile* substances in *alcohol*; mostly *strong* preparations. (Exception, sweet spirits of niter.)

F. *Liquors* are solutions of *nonvolatile* substances in *water*; mostly *weak* preparations. (Exceptions, the arsenic solutions and those for external use.)

J. *Tinctures* are solutions of *nonvolatile* substances in *alcohol*; mostly *strong* preparations. (Exceptions are the aromatic and stomachic [bitter] drug tinctures.)

A. Much used waters are:

Aqua ammoniæ.  
Aqua camphoræ.  
Aqua chloroformi.  
Aqua cinnamoni.  
Aqua menthæ piperitæ.

H. Some of the commonly used spirits are:

Spiritus ammonii aromaticus.  
Spiritus camphoræ.  
Spiritus chloroformi.  
Spiritus glycerylis nitratis.  
Spiritus menthæ piperitæ (essence of peppermint).

F. Some of the commonly used liquors are:

Liquor calcis (lime water).  
Liquor cresolis compositus.  
Liquor formaldehydi.  
Liquor hydrogenii dioxidi.  
Liquor hypophysis.  
Liquor magnesii citratis.  
Liquor plumbi subacetatis.  
Liquor potassii arsenitis (Fowler's solution).  
Liquor potassii hydroxidi.  
Liquor sodæ chlorinata (Labarraque's solution).  
Liquor sodii hydroxidi.

## J. The most used tinctures are :

Tinctura aconiti.  
 Tinctura belladonnæ foliorum.  
 Tinctura benzoini composita.  
 Tinctura capsici.  
 Tinctura cardamomi.  
 Tinctura cinchonæ.  
 Tinctura colchici seminis.  
 Tinctura digitalis.  
 Tinctura ferri chloridi.  
 Tinctura gentianæ composita.  
 Tinctura hyoscyami.  
 Tinctura iodi.  
 Tinctura lobeliæ.  
 Tinctura myrrhæ.  
 Tinctura nucis vomicæ.  
 Tinctura opii, tinctura opii camphoratae and tinctura  
 opii deodorati.  
 Tinctura rhei aromatica.  
 Tinctura scillæ.  
 Tinctura strophanthi.  
 Tinctura zingiberis.

B. *Elixirs* are sweetened liquid preparations containing alcohol. They are weak preparations, and the National Formulary contains a large number.

C. *Emulsions* are liquid preparations representing a suspended oil or resin.

D. *Fluidextracts* are liquids representing exact strengths of the drugs, i. e., 1 cubic centimeter (15 minims) contains the medicinal properties of 1 gram (15 grains) of the drug.

## D. The most important fluidextracts are :

Fluidextractum cascaræ sagradæ.  
 Fluidextractum cascaræ sagradæ aromaticum.  
 Fluidextractum ergotæ.  
 Fluidextractum glycyrrhizæ.  
 Fluidextractum sennæ.

E. *Infusions* are weak watery preparations. One only is of value, viz., infusum digitalis.

G. *Mixtures* are liquids containing more than one drug, often an insoluble one. Some much used in the past are :

Brown mixture (mistura glycyrrhizæ compositus).  
 Chalk mixture (mistura cretæ).

The National Formulary contains a long list of mixtures.

I. *Syrups* are very sweet watery solutions of one or more drugs. These weak preparations are prescribed too frequently, as they readily cause disturbance of the stomach, and do not often modify a bad-tasting drug, but may even protract the taste. Sweet cough syrups are an abomination. Some much used syrups are:

Syrupus.  
Syrupus ferri iodidi.  
Syrupus ipecacuanhæ.  
Syrupus pruni virginianæ.  
Syrupus rhei aromaticus.  
Syrupus scillæ.  
Syrupus sennæ.  
Syrupus tolutanus.

### 3. *Semisolids for External Use*

A. and B. The principal difference between *cerates* and *ointments* is their melting-points. The ointments contain more lard or petroleum fat and less wax than the cerates, hence they have a lower melting point than the latter. Cerates do not melt when applied to the skin. The following ointments are much used:

Unguentum acidi borici.  
Unguentum belladonnæ.  
Unguentum chrysarobini.  
Unguentum hydrargyri.  
Unguentum hydrargyri ammoniatum.  
Unguentum hydrargyri dilutum.  
Unguentum hydrargyri oxidi flavi.  
Unguentum picis liquidæ.  
Unguentum sulphuris.  
Unguentum zinci oxidi.

### 4. *Liquids for External Use*

Some *waters*, some *liquors*, some *tinctures* and the *liniments*, as the name implies, are used externally only. Most of the liniments are stimulating to the skin, only two being sedative, viz., the belladonna liniment and the carron oil (linimentum calcis).



## SYNONYMS

The following are frequently used synonyms:

AQUA FORTIS, Acidum nitricum, U. S. P.  
 AQUA REGIA, Acidum nitrohydrochloricum, U. S. P.  
 BASHAM'S MIXTURE, Liquor ferri et ammonii acetatis, U. S. P.  
 BASILICON OINTMENT, Ceratum resinæ, U. S. P.  
 BLACK DRAUGHT, Infusion sennæ compositum, U. S. P.  
 BLACK WASH, Lotio nigra, N. F.  
 BLAUD'S PILL, Pilula ferri carbonatis, U. S. P.  
 BLEACHING POWDER, Calx chlorinata, U. S. P.  
 BLUE MASS, Massa hydrargyri, U. S. P.  
 BLUE OINTMENT, Unguentum hydrargyri dilutum, U. S. P.  
 BLUE VITRIOL, Cupri sulphas, U. S. P.  
 BROWN MIXTURE, Mistura glycyrrhizæ composita, U. S. P.  
 CARRON OIL, Linimentum calcis, U. S. P.  
 DOBELL'S SOLUTION, Liquor sodii boratis compositus, N. F.  
 DONOVAN'S SOLUTION, Liquor arseni et hydrargyri iodidi, U. S. P.  
 DOVER'S POWDER, Pulvis ipecacuanhæ et opii, U. S. P.  
 EPSOM SALTS, Magnesii sulphas, U. S. P.  
 FOWLER'S SOLUTION, Liquor potassi arsenitis, U. S. P.  
 GLAUBER SALT, Sodii sulphas, U. S. P.  
 GOULARD'S EXTRACT, Liquor plumbi subacetatis, U. S. P.  
 GRAY POWDER, Hydrargyrum cum creta, U. S. P.  
 GREGORY'S POWDER, Pulvis rhei compositus, U. S. P.  
 HIVE SYRUP, Syrupus scillæ compositus, U. S. P.  
 HOFFMANN'S DROPS, Spiritus ætheris, U. S. P.  
 HUXHAM'S TINCTURE, Tinctura cinchonæ composita, U. S. P.  
 LABARRAQUE'S SOLUTION, Liquor sodæ chlorinatæ, U. S. P.  
 LUGOL'S SOLUTION, Liquor iodi compositus, U. S. P.  
 LUNAR CAUSTIC, Argenti nitras fusus, U. S. P.  
 MAGENDIE'S SOLUTION, Liquor morphinæ hypodermicus, N. F.  
 MONSELL'S SOLUTION, Liquor ferri subsulphatis, U. S. P.  
 SUGAR OF LEAD, Plumbi acetas, U. S. P.  
 VALLET'S MASS, Massa ferri carbonatis, U. S. P.  
 WARBURG'S PILL, Pilula antiperiodica, N. F.  
 WARBURG'S TINCTURE, Tinctura antiperiodica, N. F.  
 YELLOW WASH, Lotio flava, N. F.

## THERMOMETRIC EQUIVALENTS

To convert degrees Centigrade to degrees Fahrenheit, multiply by 9, divide by 5, and add 32 to the quotient. To convert degrees Fahrenheit to degrees Centigrade, subtract 32, multiply by 5 and divide by 9. A few commonly used equivalents are as follows:

C.	F.	
0	= +32	Freezing point of water.
37	= 98.6	Normal body temperature.
40	= 104	
60	= 140	Sterilizing and Pasteurizing temperature.
100	= 212	Boiling point.

## WEIGHTS AND MEASURES

It is not necessary to describe here the old system or to give its tables of weights and measures, as they

occur in every book on prescription-writing, but some tables of approximate equivalents to the metric system will be offered. Exact equivalent tables are a delusion and only tend to befog and discredit the metric system. When it is remembered how the doses of drugs vary, it will be recognized how absurd it is to figure an equivalent to its finer determinations.

It is not necessary to declare that the decimal (metric) system of prescription-writing is the better, because the fact is recognized by all and the only hindrance to its use is the supposed difficulty of mastering it. Science of all countries has adopted it—even our own Pharmacopeia. If the novice in the use of the metric system in prescription-writing will remember that it is a decimal system like our monetary system, that everything on the left of the decimal point or line represents grams or cubic centimeters [dollars], that everything on the right of the decimal line represents centigrams, milligrams, or fractions of a cubic centimeter [cents and mills], he will soon understand the system.

In this country it is customary in writing prescriptions in the metric system to write for solids in terms of grams and fractions of grams, and for liquids in terms of cubic centimeters or fractions of cubic centimeters or mils. We shall for the present continue to use the cubic centimeter for liquid measure though the new Pharmacopeia has adopted the mil as a unit. The same decimal line which should be ruled on the prescription blank answers for both solid and liquid metric measures, and precludes all possibility of careless decimal mistakes, as:

gm.  
c.c.  
• |

It is best to use in prescribing only two denominations, grams and milligrams. Liquids, of course, are expressed as cubic centimeters.

TABLE OF THE APPROXIMATE EQUIVALENTS IN THE TWO SYSTEMS

	gm.	
	c.c.	
1 grain (gr.i) = approximately....	0 065	= 65 milligrams = 1 grain.
1 minim (℥i) = approximately....	0 065	= $\frac{65}{1000}$ of a cubic centimeter = 1 minim.
15 grains (gr.xv) = approximately..	1	= 1 gram = 15 grains.
15 minims (℥xv) = approximately.	1	= 1 cubic centimeter = 15 minims.
1 dram (ʒi) = approximately.....	4	= 4 grams = 1 dram.
1 fluidram (fl.ʒi) = approximately.	4	= 4 cubic centimeters = 1 fluidram.
1 ounce (ʒi) = approximately.....	30	= 30 grams = 1 ounce.
1 fluidounce (fl.ʒi) = approximately.	30	= 30 cubic centimeters = 1 fluidounce.
1 quart	= approximately 1000 c.c., or 1 liter.	
1 pint	= approximately 500 c.c.	
1 teaspoonful	= approximately 5 c.c.	

As above declared, it is useless to translate the old system into exact equivalents of the new system. One must compute the doses in the new system; one must forget the size of stock bottles and order amounts of liquids in multiples of five, as 15 c.c., 25 c.c., 50 c.c., 100 c.c., or 200 c.c.; one must remember that 5 c.c. is a teaspoonful dose, i. e., an ordinary teaspoon holds 5 c.c. and not 4 c.c. or a liquid dram; in other words, *every* prescriber in the old system has *always* given a larger dose than he intended when he computed the dose by fluidrams and then administered a teaspoonful; one should remember that the drop, so much used in prescribing strong liquid preparations, is as correct in the new system as in the old. All of these suggestions must be followed out to use the metric system successfully.

It is always a good plan to use a stub prescription blank, and on the stub the individual doses may be

written. This is another check on mistakes and also preserves for reference the exact dose given on the exact date, as:

Stub (one dose)	Prescription for 20 doses	
R	R	gm. c.c. Old system
Strychn. sulph.  001	Strychninæ sulphatis..  02	gr. 1/3
Ferri reducti.  05	Ferri reducti..... 1	or gr. xv
Quin. sulph..  10	Quininæ sulphatis..... 2	gr. xxx
M. et F. cap.	M. et F. capsulas 20.	
Sig.: t.i.d., p.c.	Sig.: A capsule 3 times a day, after	
Name.	meals.	
Age.		
Date.		

Or,

Stub (one dose)	Prescription for 20 doses	
R	R	gm. c.c. (approximately) Old system
Codein. sulph.. .01	Codeinæ sulphatis..  20	gr. iv
Ammon. chlor. .25	Ammonii chloridi.. 5	3iiss
Syr. acid. cit... 1.25	Syrupi acidi citrici. 25	fl. 3i
Aquae q. s..ad 5.	Aquae q. s....ad 100   q. s. ad. fl. 3iv	
M.	M.	
Sig.: 5 c.c.q. 2 h.	Sig.: A teaspoonful, in water, every	
in H <sub>2</sub> O.	two hours.	
	Shake.	

It is better to use the Arabic numerals instead of the Roman in the new system, as:

R

Pilulas rhei compositas No. 20.  
Sig.: One pill after supper.

Stub (single dose)	Prescription	
R	R	gm. c.c. Old system
Tr. digitalis.	Tincturæ digitalis... 25	or fl. 3i
Sig.: 10 drops in	Sig.: Ten drops, in water, twice a day,	
H <sub>2</sub> O b.i.d., p.c.	after meals.	

Stub	Prescription	
R	R	gm. c.c. Old system
Ung. hg. ammon.	Unguenti hydrargyri	or
Petrolati .....āā 10	ammoniati ..... 10	āā 3iiss
M.	Petrolati ..... 10	
Sig.: Externally.	M.	
	Sig.: Used externally as directed.	



## INCOMPATIBILITY

This is prevented only by great care and simplicity. Too many drugs should not be prescribed. Too many solutions should not be combined. Too many drugs and too much medicine should not be given to one patient on any one or two days. Many drugs are cumulative and many of their physiologic activities are antagonistic. Drugs may be incompatible *therapeutically, chemically and pharmaceutically*.

*Therapeutic incompatibility* occurs when drugs are combined which have antagonistic physiologic actions.

*Chemical incompatibility* occurs when from the combination of two or more drugs a new and undesired chemical compound results.

*Pharmaceutic incompatibility* occurs when drugs are combined which form, either immediately or later, cloudy, precipitated or decomposed solutions.

An educated physician should be ashamed to perpetrate a therapeutic incompatibility either in a prescription or in a patient. It is not therapeutic incompatibility, however, to modify a too decided action of a drug with one that corrects an undesired effect. This is a part of therapeutic science.

Pharmaceutic incompatibility is so closely related to chemical incompatibility that many times both are governed by the same rule. Such incompatibility is difficult to avoid, and therefore it is advisable to adopt simplicity in prescription-writing; this is really a therapeutic gain.

Below is given an alphabetic list of drugs which should generally be given alone, especially in solutions. The chemical reasons are appended:

*Acids*, unless very dilute and in small amount, should be prescribed alone. They combine with bases to form salts, and are incompatible with oxids, alkalies, alkaline salts, hydrates and carbonates. They usually precipitate albumin.

*Alkalies and alkaline carbonates* should rarely be prescribed in solution with other drugs. They form salts with acids and precipitate many metallic and alkaloidal salts.

*Alkaloidal salts* should rarely be combined with other drugs in solutions. They are precipitated by alkalies, alkaline carbonates, earthy carbonates, preparations containing tannic acid, and by iodids in solution.

*Arsenic* (arseni trioxidum, arsenious acid) should generally be prescribed in solutions alone.

It is precipitated by salts of iron, magnesia, and solutions of lime.

*Bromids* in solution should not be combined with alkaloids. They precipitate the salts of morphin, quinin, and strychnin from neutral solutions.

*Ferric and ferrous salts* should generally be prescribed alone. They are incompatible with tannic acid and all drugs containing it; with alkaline carbonates, ammonia, and acacia.

*Iodids* should generally be prescribed alone.

They are incompatible with salts of alkaloids and metals and with mineral acids.

*Mercuric chlorid* (corrosive sublimate) should generally be prescribed alone. It is incompatible with many drugs.

*Mercurous chlorid* (calomel), though insoluble; had best not be prescribed in mixtures. In solutions containing chlorids it may be converted into the mercuric salt.

*Resins*, including oleoresins, fluidextracts and tinctures containing resins, should not be prescribed in watery solutions, though they may be ordered in emulsion by suspending them with the mucilage of acacia or tragacanth.

They are all precipitated by water.

*Silver nitrate* solutions and solutions of all silver salts must be ordered alone, and kept in dark bottles.

*Strophanthus* in the form of the tincture should not be prescribed in solutions containing water.

*Spirits* (spiritus) should not be prescribed with watery preparations. They become cloudy on the addition of water.

*Tannic acid*, and all drugs containing tannic acid, should not be prescribed with most drugs. They are incompatible with alkaloids, salts of iron, lead, silver and antimony.

## THE HARRISON NARCOTIC LAW

This law affects the physician both as a prescriber and as a dispenser of drugs. It requires the prescribing physician to register with the collector of internal revenue of the district. In writing a prescription for narcotic or habit forming drugs, coming under this act, the physician must write thereon the name and address of the patient, and must have on the prescription his office address and his registry number. He must date the prescription and sign his name in full. He need not keep either copies or records of

prescriptions ; this is done by the druggist. These prescriptions cannot be refilled.

If the physician desires any of the specified drugs for his own use, he must make out an order for them on a blank form bearing his registry number. These blanks may be secured from the Internal Revenue Department. The physician cannot order drugs for his own use on a prescription blank.

When he dispenses, the physician assumes the work of the druggist and is subject to the same rules. He must keep a record in a suitable book of all habit-forming drugs dispensed, the names and addresses of persons dispensed to and the dates. Such treatments as he may personally administer or cause to be administered when away from his office need not be recorded.

### PRESCRIBING ALCOHOL

Under the decision of the Commissioner of Internal Revenue, physicians may prescribe wines and liquors for internal use, or alcohol for external uses. Special regulations and forms for prescribing and for utilizing alcohol in medical practice have been issued. The physician may secure these from the commissioner in his district. In no case shall a physician prescribe alcoholic liquors unless the patient is under his constant personal supervision.

The physician must see to it that the prescription indicates clearly the name and address of the patient, including street and apartment number, if any, the date when written, the condition or illness for which prescribed, and the name of the pharmacist to whom the prescription is to be presented for filling.

The physician must also keep a record in which a separate page or pages is allotted each patient for whom alcoholic liquors are prescribed, and shall enter therein, under the patient's name and address, the date of each prescription, amount and kind of liquors dispensed by each prescription, and the name of the pharmacist filling the prescription.

Pharmacists are instructed to refuse to fill prescriptions if they have any reason to believe that physicians are dispensing for other than strictly legitimate medicinal uses, or that a patient is securing, through one

or more physicians, quantities in excess of the amount required for legitimate uses.

A physician may secure alcohol for professional use only by securing a permit from the collector of internal revenue of his district. Permits may be obtained from the collector. Physicians who make application must do so on a special form and must make a statement that the liquor is for use in the course of their professional practice only, and that it is to be used either in the compounding of medicines or for use without change for non-beverage purposes only.

The form of alcohol used in filling prescriptions—whether denatured or not—depends on whether the prescription is for internal or external use and on what kind of alcohol the prescription specifies. Nonbeverage alcohol, medicated or denatured so as to be unfit for beverage purposes, may be used for filling prescriptions if so indicated.

## LATIN

As Latin is no longer required for matriculation by many medical schools it seems unwise to attempt to outline the correct use of Latin in prescriptions in a book of this character. Therefore Latin rules are omitted from this edition of the Handbook. Prescriptions are well written in English with the United States Pharmacopeia Latin names or with the official abbreviations. However, the Latin abbreviations are so much used that a few are listed here with a statement of their meanings.

### *Abbreviations*

Abbreviation	Latin	Translation
āā	ana (Greek)	of each
ad	ad	up to
cap.	capsula,—ae.	a capsule
co. or comp.	compositus—a-um	compound
div.	divide	divide
ext.	extractum,—i	an extract
fac	fac	make
flex.	fluidextractum,—i,	a fluid extract
gtt.	gutta,—ae	drop or drops
liq.	liquor,—is.	a solution
m.	misce	mix
mist.	mistura,—ae	a mixture
pil.	pilula,—ae	a pill
pulv.	pulvis,—eris	a powder
q. s.	quantum sufficit	a sufficient quantity
ss.	semis, semissis	a half
sig.	signa	write
sol.	solutio,—onis	a solution
spts.	spiritus	a spirit
t. i. d.	ter in die	three times a day
tr.	tinctura,—ae	a tincture



## DOSAGE

The dose of a drug should be based on the age, weight and individuality of the patient, and the necessity for a strong action of the drug.

The frequency of the dose is determined by the results obtained, by the length of time it takes the drug to be eliminated or cease its action, and the possibility of its causing a cumulative effect.

While age is an all-important element in the determination of the dose, the weight, unless in the obese, is the most important element, except in the case of narcotics given to children. Children have more central nervous system as compared to their weight than adults, and therefore are more profoundly affected by drugs which act on the brain than are adults. In other words, a given dose of a narcotic, especially of the opium series, for an adult must be more reduced in size for a young child than any table of reduction computed by age or weight would determine.

The best simple rule of dosage by age is the following:

At 20 years, the adult dose.

At 10 years,  $\frac{1}{2}$  the age,  $\frac{1}{2}$  the dose.

At 5 years,  $\frac{1}{4}$  the age,  $\frac{1}{4}$  the dose.

At  $2\frac{1}{2}$  years,  $\frac{1}{8}$  the age,  $\frac{1}{8}$  the dose.

At 1 year,  $\frac{1}{12}$  the dose.

Children whose ages are between the ones here specified may readily be prescribed doses a little more or less than the dose determined by the age nearest theirs in the table.

The relation of size and weight to the dose is all-important. A large child of 2 years should certainly receive a larger dose than a weakly, small child of the same age. Also a small adult of 20 should receive less than a large muscular individual of the same age. The blood of an adult represents about one-thirteenth of his total weight. This is not true of children or of the obese. Hence the dose of an obese individual may be even less than if his weight were normal.

The following are the average weights for normal adult males. It should be remembered that females up to the age of 45 or 50 generally weigh less than

males; also that a range of from 25 to 30 pounds above or below the average weight, the patient's general condition being good, is not necessarily considered a weight too high or too low for acceptance as an insurance risk. Above or below this range of 25 to 30 pounds from the average is generally considered overweight or under-weight, and the acceptance of such an individual for insurance becomes questionable.

TABLE OF AVERAGE WEIGHT TO HEIGHT AT DIFFERENT AGES

Ft. In.	Year							
	15-24	25-29	30-34	35-39	40-44	45-49	50-54	55-60
5-0	120	125	128	131	133	134	134	134
5-1	122	126	129	131	134	136	136	136
5-2	124	128	131	133	136	138	138	138
5-3	127	131	134	136	139	141	141	141
5-4	131	135	138	140	143	144	145	145
5-5	134	138	141	143	146	147	149	149
5-6	138	142	145	147	150	151	153	153
5-7	142	147	150	152	155	156	158	158
5-8	146	151	154	157	160	161	163	163
5-9	150	155	159	162	165	166	167	168
5-10	154	159	164	167	170	171	172	173
5-11	159	164	169	173	175	177	177	178
6-0	165	170	175	179	180	183	182	183
6-1	170	177	181	185	186	189	188	189
6-2	176	184	188	192	194	196	194	194
6-3	181	190	195	200	203	204	201	198

In determining the dose it is most important to consider whether or not the patient has any exceptional susceptibility to the given drug. When an idiosyncrasy or abnormal susceptibility to a certain drug or to drugs of a certain class is known, the drugs causing it should, if possible, not be administered. Hypersensitization, termed anaphylaxis, is a cause of idiosyncrasy to some drugs.

Sometimes such undesired action of a drug occurs with the first dose only, notably in the case of quinin, and a tolerance to the drug is, after this first dose, temporarily acquired.

A patient may, on the other hand, be abnormally tolerant to a given drug, so that unusually large doses are necessary to cause an effect.

Still other very important modifications of the dose are caused by disease, by the condition of the patient's digestive and absorptive system, and by the condition of his eliminative organs. The disease pres-

ent may create a tolerance or an increased susceptibility to a drug. Slow absorptive powers may render the action of the drug almost impossible or allow accumulation of dangerous amounts of the drug (under which conditions the drug should be given hypodermically, if it is needed). Slow or retarded elimination due to defective eliminative organs will allow accumulative action of many drugs.

The drugs which are most frequently found unexpectedly to cause undesirable or even serious symptoms in susceptible individuals are quinin, salicylates, atropin-containing drugs, iodine-containing drugs, and opium and its alkaloids.

The diseased conditions that most modify (lessen) the dose of a drug are nephritis and cirrhosis of the liver.

A condition of shock precludes immediate absorption from the stomach, hence such a condition must be combated, if by drugs, hypodermatically.

### *Frequency of the Dose*

It should be carefully learned how long, ordinarily, it takes a given dose of a drug to act, and how long before it is mostly eliminated. This determines the frequency of the dose. Also some drugs are eliminated so slowly that they tend to accumulate in the system or are deposited in the various organs so that medication may occur days and even weeks after the cessation of the administration of the drug.

A few of the rapidly acting drugs are:

Alcohol	Iodids
Ammonia	Salicylates
Camphor	Strophanthin
Caffein	Strychnin
Chloral	

These act in a few minutes to an hour or so, hence the intervals at which they may be given range from every hour to every three hours, or three times a day, according to the drug.

A few of the slowly acting drugs are:

Arsenic	Quinin
Atropin	Synthetic antipyretics
Bromids	Synthetic hypnotics
Digitalis	Thyroid
Mercury	

These act in from several hours to twenty, hence should be given only once or twice a day, according to the drug.

A few of the drugs that tend to accumulate in the system are:

Arsenic	Digitalis
Atropin	Mercury
Bromids	Strychnin

Many drugs cause eruption on the skin either due to irritation of the stomach and duodenum or to their being more or less excreted by the skin and irritating the glands during such excretion, or they may cause flushing of the skin.

Examples of drugs causing the first kind of irritation are: copaiba, chloral, opium, quinin, salicylates, synthetic compounds, volatile oils; drugs of the second type are arsenic, bromids and iodids; those of the third type are antitoxin, atropin and thyroid.

It should always be remembered that some drugs are excreted into the milk; hence if the mother is nursing her baby, some drugs should be avoided, and some given only infrequently; or, on the other hand, the baby may be medicated through the mother.

Generally speaking, most narcotics (opium, bromids, etc.), most metals and endocrine gland extracts (arsenic, mercury, iodids, thyroid), most cathartics and quinin are excreted in the milk.

## METHODS OF ADMINISTERING DRUGS

Drugs and serums are more than occasionally administered intravenously. As the technic requires skill and most perfect asepsis, this method should not frequently be resorted to. Moreover, when a drug or serum is injected intramuscularly, the rate of absorption and activity are almost as rapid as when it is given intravenously, and the danger of accidents is much less.



The hypodermatic or subcutaneous method is of very great value in all emergencies, but should not be used too frequently. Of course, the most frequent need for such medication is caused by pain, which must be combated by morphin or its equivalent. The danger of acquiring a habit is greater when the drug is used hypodermatically than when it is given in any other way.

The usual method of giving a drug is by the mouth, either in liquid, powder, pill, cachet, capsule or tablet. A drug will act more quickly if given in liquid solution on an empty stomach. If it is disagreeable, however, it should be given in capsule if the character and dose of the drug will allow. If a drug is irritant, it should not be given on an empty stomach. A disagreeable liquid drug should not be combined with a syrup, which does nothing but prolong the taste and upset the stomach, but should be given in plain water to be followed by any kind of taste the patient prefers, such as orange, lemon, or by a peppermint or wintergreen candy, for example. Or the liquid may be given in a sour mixture, as lemonade or syrup of citric acid and water, or it may be given in a mineral or carbonated water. A powder may be given in milk or in an effervescing water.

Capsules are the nicest means of giving drugs disagreeable in taste and small in dose. The contents of a capsule should be dry for rapid solution, the principal advantage of a capsule over a pill. If rapid action is desired, or if it is feared that the capsule, slowly dissolving on a small part of the mucous membrane of the stomach, will irritate the membrane, the capsule may be uncapped at the moment of swallowing, and the result is the same in the stomach as though the drug had been taken as a powder. Alcohol in any form in the stomach will retard the solution of a gelatin capsule. Pills are not so much used as before the capsule became so popular. The solution and absorption of a pill must be slow, unless it contains some particles of a substance that swells with water, as starch. Sugar, chocolate, or gelatin-coated pills and tablets make the solution still slower, though in the case of drugs to act on the intestine this may be of advantage.

The much-used tablet, compressed or triturate, doubtless renders much medication valueless, and perhaps, fortunately, harmless. The speed of solution of most tablets on the market is problematic; hence if the action of a tablet is immediately desired it should be predissolved, or at least crushed by the teeth before swallowing. All antipyretic coal-tar tablets should be crushed before swallowing and then a good drink of water taken with them. It should not be forgotten that anything that may bite or irritate the membrane of the mouth will do the same to the mucous membrane of the stomach. Hence bromid tablets should never be taken undissolved. Potassium chlorate tablets dissolved in the mouth or swallowed are dangerous. Potassium chlorate solutions for the mouth and throat are valuable, but there is no justification for ever taking potassium chlorate into the stomach or into the system.

A very soluble tablet dissolved and absorbed from the mouth will give almost as rapid action as when given hypodermatically.

The rectum absorbs drugs given by means of suppositories or injections nearly and sometimes quite as rapidly as does the stomach. Sedatives and some laxatives only are administered by suppositories for systemic effect.

A few drugs are given endermically, but except in the case of mercury the method is uncertain.

Mucous membranes may be treated by douching, injection, insufflation, and those of the air passages by inhalation. Some drugs are absorbed by all of these methods, and if poisonous drugs are used, the possibility of too great an absorption must always be kept in mind.

## CLASSIFICATION OF DRUGS

While dictionaries and encyclopedias must be arranged alphabetically for ready reference, alphabetic arrangement of drugs for the practicing physician is very unsatisfactory. For a practicing physician, classification based on chemical constituency, pharma-

cologic peculiarities, or toxic action is absolutely of no value. A drug may have a chemical, physiologic or toxic activity that is of no value from a therapeutic standpoint. The classification always of value and always necessary for the practicing physician is one based on therapeutic uses.

The following classification selects certain drug for certain therapeutic indications. While this enumeration of drugs does not comprise all that are of value, it does comprise the best, and any drug that aspires to a place in such a classification must show positive physiologic activity and therapeutic success to prove that it should be classed among these, the best drugs. Under each heading the drugs are named alphabetically and not in the order of their value.

#### I. DRUGS APPLIED FOR THEIR LOCAL ACTION ON THE SKIN, WOUNDS OR VISIBLE MUCOUS MEMBRANES.

*Corrosives or Caustics.*—Acetic acid, nitric acid, alum, silver nitrate, phenol, potassium hydroxid, sodium carbonate and sodium hydroxid, zinc chlorid.

*Disinfectants and Antiseptics.*—Benzoic, boric and salicylic acids, silver nitrate, chlorid of lime, camphor, cresol, eucalyptus, formaldehyde, mercuric chlorid, mercuric iodid, hydrogen peroxid, iodoform, phenol, tar, potassium permanganate, sulphur thymol and zinc chlorid.

*Astringents.*—Tannic acid, alcohol, alum, liquor alumni subacetatis, bismuth subcarbonate, subgallate and subnitrate, copper sulphate, iron chlorid and sulphate, lead and zinc acetates, zinc oxid and sulphate.

*Styptics.*—Soluble astringents, iron chlorid and alum.

*To Contract Vessels.*—Epinephrin.

*Emollients: Powders.*—Starch, bismuth subcarbonate and subnitrate, magnesium carbonate, talcum, zinc oxid.

*Protectives.*—Lard, wool fat, white wax, collodion, fixed oils and petrolatum.

*Local Anodynes and Analgesics for Pain and Itchings.*—Ammonia water, atropin, chloroform, cocain, phenol, and sodium bicarbonate.

*Local Anesthetics.*—Ether, ethyl chlorid, cocain, menthol, procain and quinin and urea hydrochlorid.

## II. DRUGS USED FOR AFFECTIONS OF THE ALIMENTARY TRACT.

*Mouth and Throat.*

*Demulcent.*—Acacia, glycerin and potassium chlorate.

*To Lessen Salivation.*—Atropin.

*Stomach.*

*Digestives.*—Hydrochloric acid and pepsin.

*Emetics.*—Apomorphin hydrochlorid, emetin hydrochlorid, ipecac, mustard, sodium chlorid, zinc sulphate.

*To Lessen Irritation and Vomiting.*—Bismuth subcarbonate and subnitrate, chloral, chloroform, codein, lime water, menthol, morphin and opium.

*To Lessen Acidity.*—Calcium and magnesium carbonates, lime water, magnesium oxid, sodium bicarbonate.

*To Increase Secretion, Bitters.*—Quinine, gentian, nuxvomica, strychnin.

*Carminatives.*—Alcohol, camphor, capsicum, cardamom, cloves, volatile oils, ginger.

*Intestine.*

*To Promote Digestion.*—Pancreatic extract (?).

*To Promote Evacuation.*—

*Vegetable Purgatives.*—Aloes, aloin, colocynth, elaterin, jalap, podophyllum, cascara, rhubarb, castor oil, senna, croton oil.

*Saline Purgatives.*—Magnesium carbonate, sulphate, oxid and citrate, potassium bitartrate, potassium and sodium tartrate, sodium phosphate and sodium sulphate.

*Mercurial Purgatives.*—Calomel, mercury with chalk.

*Miscellaneous.*—Fel bovis, glycerin, sulphur, petrolatum and phenolphthalein.

*To Lessen Movement and Reflex Spasm.*—Tannic acid, atropin, belladonna, bismuth subcarbonate, subgallate and subnitrate, lime water, morphin and opium.

*To Destroy Parasites, Anthelmintics.*—Aspidium, chloroform, calomel, pelletierin, salol, santonin, turpentine, thymol.

## III. DRUGS USED FOR THEIR EFFECTS ON THE CIRCULATION.

*Heart.*

*To Strengthen Contraction.*—Digitalis, strophanthus.

*To Accelerate Pulse.*—Atropin, caffein, camphor.

*To Slow Pulse.*—Aconite, digitalis, strophanthus.

*Vessels.*

*To Contract Vessels and Raise Blood Pressure.*—Epinephrin, ergot, hypophysis, atropin, caffein.

*To Relax Vessels and Lower Blood Pressure.*—Amyl nitrite, nitroglycerin, sodium nitrite.

*To Remove Fluid.*—Diuretics, diaphoretics, vegetable and saline purgatives. Also digitalis, calomel, squill, strophanthus.

#### IV. DRUGS USED FOR THEIR EFFECTS ON THE GENITO-URINARY SYSTEM.

*To Increase the Flow of Urine, Diuretics.*—Caffein, digitalis, calomel, potassium salts, squills, spartein sulphate, strophanthus, theobromin.

*To Render the Urine Less Acid.*—Potassium acetate, bicarbonate and citrate, sodium carbonate and bicarbonate.

*To Render the Urine Aseptic.*—Benzoic and salicylic acids, acetylsalicylic acid, hexamethylenamin, salol, sandalwood oil, sodium benzoate, sodium salicylate.

*To Promote Menstruation, Emmenagogues.*—Vegetable purgatives, corpus luteum.

#### V. DRUGS USED FOR THEIR EFFECTS ON THE RESPIRATORY SYSTEM.

*To Stimulate the Respiratory Center.*—Atropin, caffein, camphor, strychnin.

*To Reduce the Irritability of the Center in Cough.*—Chloroform, codein, heroin, morphin, opium.

*To Increase and Liquefy the Bronchial Secretion.*—Ammonium carbonate, apomorphin, ipecac, potassium iodid, squill, sodium iodid.

*To Lessen the Secretion of the Bronchi (?).*—Benzoin, turpentine, atropin.

*To Relax Bronchial Spasm in Asthma.*—Amyl nitrite, atropin, belladonna, nitroglycerin, potassium iodid, sodium iodid, sodium nitrite, chloral, morphin.

#### VI. DRUGS USED FOR THEIR EFFECTS ON THE CENTRAL NERVOUS SYSTEM.

*Stimulants.*—(a) (the spinal cord) strychnin, (b) (the brain and medulla) atropin and caffein.

*Depressants.*—(a) (to paralyze sensation) ether, ethyl chlorid, chloroform; (b) (to induce sleep and rest) alcohol, chloral, codein, morphin, opium, paraldehyde, scopolamin, sulphonal, barbital; (c) (to relieve pain)



acetanilid, phenacetin, salicylic acid, alcohol, antipyrin, aspirin, chloral, codein, morphin, sodium salicylate.

#### VII. DRUGS USED TO REDUCE FEVER TEMPERATURE.

Actanilid, phenacetin, salicylic acid, aconite, antipyrin, aspirin, quinin, sodium salicylate.

#### VIII. DRUGS USED FOR THEIR EFFECTS ON THE LIVER.

*To Increase Bile.*—Salicylic acid, fel bovis.

#### IX. DRUGS USED FOR THEIR EFFECTS ON THE BLOOD.

*To Increase the Hemoglobin.*—Arsenic and iron salts and combinations.

*To Render the Blood Alkaline.*—Potassium acetate, bicarbonate and citrate, sodium bicarbonate and carbonate

*To Increase the Coagulability (?)*.—Calcium salts, horse or human blood serum.

#### X. DRUGS USED FOR SPECIFIED DISEASES.

*Malaria.*—Arsenic, quinin.

*Syphilis.*—Mercury, iodids, arsenic, arsphenamin.

*Rheumatic Fever.*—Salicylates.

*Diphtheria.*—Serum antidiphthericum.

*Tetanus.*—Serum antitetanicum.

*Trypanosomiasis.*—Antimony and potassium tartrate, sodium arsanilate.

*Gout.*—Acidum phenylcinchonicum, colchici semen.

#### XI. DRUGS USED FOR THEIR EFFECTS ON THE SKIN.

*Irritants.*—Alcohol, ammonia, camphor, cantharides, capsicum, menthol, mustard, turpentine, croton oil.

*Disinfectants or Irritants Used Chiefly in the Form of Ointments in Parasitic Skin Diseases.*—Balsam of Peru, benzoin, camphor, chrysarobin, mercury, ichthyol, iodine, tar, resorcin, sulphur, thymol.

*To Increase Sweat.*—Camphor, ipecac, opium, pilocarpin.

*To Lessen Sweat.*—Atropin, belladonna.

#### XII. DRUGS USED LOCALLY FOR THEIR EFFECTS ON THE EYE.

*To Dilate the Pupil and Relax Accommodation.*—Atropin cocain, homatropin, scopolamin.

*To Contract the Pupil and the Ciliary Muscle.*—Physostigmin salicylate, pilocarpin hydrochlorate.

## OTHER PROPERTIES OF WELL KNOWN DRUGS

The following classification is taken from "Introduction to Materia Medica and Pharmacology" by Oliver T. Osborne.

*Drugs and Preparations Which May Cause an Eruption on, or Itching of, the Skin.*—Antitoxin, arsenic, belladonna, bromids, chloral, copaiba, iodid, opium, quinin, salicylic acid, synthetic compounds, volatile oils and drugs containing them.

*Drugs Which May Change the Color of the Urine:*

Drugs that increase its amount cause it to be lighter.

Drugs that irritate the kidneys cause it to be darker.

Methylene blue causes it to be green, if acid.

Phenol may cause it to be brown.

Santonin causes it to be yellow, if acid; purple, if alkaline.

Senna may cause it to be red if alkaline; yellow, if acid

Sulphonal may cause it to be very dark.

*Drugs Which Color the Feces:*

Bismuth salts color them black or dark gray.

Colchicum colors them greenish.

Iron colors them black.

Mercury colors them green.

Purgatives cause them to be darker.

*Drugs Which Are Excreted with the Milk.*—Arsenic, bromids, hexamethylenamin, iodids, lead, mercury, opium, quinin, sulphur, vegetable cathartics, volatile oils.

# TREATMENT OF POISONING

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As the symptoms and treatment of poisoning are many times so similar, it seems best to divide poisons into classes, and then to describe the treatment of each class, rather than to multiply individual descriptions.

The following classification is of types of drugs. The individual drugs with references to the class to which they belong, and therefore to the treatment advisable, will be found in a table on another page.

## CLASS 1.—Irritants of the Gastro-Intestinal Canal.

Acids.

Alkalies.

Irritant metallic salts.

## CLASS 2.—Irritants of the Central Nervous System.

Atropin-containing drugs.

Caffein-containing drugs.

Cocain.

Scopolamin (hyoscin).

Strychnin.

Volatile oils.

## CLASS 3.—Depressants of the Nervous and Circulatory Systems.

All cardiac drugs in large doses.

Coal-tar products.

Cyanids.

Hypnotics.

Narcotic drugs.

Nicotin.

Most phenol-containing drugs.

## CLASS I.—IRRITANTS OF THE GASTRO-INTESTINAL CANAL

Most irritants in weak dilutions are astringent, while most astringents in strong solutions are irritant. The action of astringents and irritants on mucous membranes is, therefore, largely one of degree. Some astringents act chemically to form albuminates with the protein substance found on moist mucous membranes, thus coating and preventing the further irritation of the membrane. At the same time the blood-vessels of the membrane are contracted, the membrane

is dried, and the secretion diminished. This is typical metallic astringent action. If this albuminate is insoluble or very slowly soluble in the media surrounding it the action just described is the only action due to the astringent, viz., there may be more or less pronounced irritation at first, but the after-effect is sedative. If, however, this albuminate tends to dissolve at its junction with the mucous membrane, the action of astringency is then continued and may become so irritating as to cause severe inflammation or with some metallic salts or acids cause ulceration and corrosion. Such drugs or preparations are called "gastro-intestinal irritants," and in poisonous doses will all produce the same immediate symptoms. Later individual symptoms or conditions develop due to the character of the substance absorbed, to its chemical nature and to the amount of local corrosion that it can cause.

Different metals have different powers of astringency and irritant action; also different salts of the same metal vary in the irritation which they will produce. The acid formed after the dissociation of the metallic ion decides the amount of irritation that the salt will cause. Also the greater the ease with which the metallic ion is dissociated from its acid ion the greater the corrosion; therefore, the soluble nitrates and chlorid are much more corrosive than the acetates, citrates and tartrates. The sulphates are between these groups in their irritant effect.

The most astringent metals in the order of their astringency are lead, iron, aluminum, copper, zinc and silver. The most astringent salt is lead acetate, while the most irritant salts are mercuric chlorid and zinc chlorid. The sulphates and acetates of copper and zinc and the nitrates of silver and lead, if applied in weak solutions, are astringent, but are irritant if in large quantities or in strong solutions. Insoluble preparations of mercury may irritate and corrode, but insoluble salts of other metals are generally only astringent. Double salts of the metals are less likely to irritate, because they ordinarily do not precipitate albumin. A styptic strongly coagulates albumin and hence causes a clot which stops hemorrhage.

## SYMPTOMS

The symptoms common to all gastro-intestinal irritants are irritation or corrosion of the mouth, throat and esophagus, depending on the concentration of the poison swallowed. Other symptoms are: more or less gastric pain; nausea; vomiting, first of the contents of the stomach, then of mucus, then often of blood; later diarrhea, first of the contents of the bowels, then mucus and, perhaps, blood are passed. There are more or less symptoms of shock due to the reflex action on the heart from irritation of the gastric branches of the pneumogastric nerve. The symptoms of collapse are a rapid, weak heart, dyspnea, cold surface of the body, clammy, cold perspiration, tendency to syncope, and a gradual failure of the pulse.

The symptoms of poisoning by gastro-intestinal irritants are:

**Immediate Symptoms:** Pain, nausea, vomiting, colic, diarrhea and collapse.

**Frequent After-Symptoms:** Inflammation and ulceration of the mouth, throat and esophagus, gastritis, duodenitis (jaundice), enteritis, albuminuria, nephritis, and ulceration of the stomach, perforation, peritonitis.

**Possible Remote Symptoms:** Fatty degeneration of the liver, kidneys and heart; strictures after healing of the corrosions and ulcerations.

## TREATMENT OF CORROSIVE POISONING

**Immediate Treatment:** Warm water drinks containing the antidote, if there is one (an emetic or a stomach-tube is rarely needed and, if necessary, should be used with great caution and gentleness); albuminous and mucilaginous drinks, as milk, egg albumin, flax-seed infusions, slippery elm infusions, etc.; hypodermatic injections of morphin sufficient to stop pain and continued vomiting. For corrosive acids the most convenient antidote is usually a solution of soap.

**Treatment of Collapse:** Rest, quiet; dry heat, especially to the region of the heart; atropin sulphate, 1/100 of a grain hypodermatically; strychnin sulphate 1/30 of a grain hypodermatically; repeated in three hours, if needed (large doses of strychnin are not advisable, as it cannot stimulate the heart or raise



the blood-pressure as so long believed); camphor, a syringe-ful hypodermatically of a saturated solution in sterile olive oil (or a ready-prepared ampule), every half hour for several doses; caffeine, as strong coffee, by rectal injection if there is no diarrhea.

**After-Treatment:** Give a saline purge, if deemed necessary. For acute gastritis give morphin, sufficient to stop the pain, mucilaginous drinks, rectal alimentation. Give cardiac stimulants, if needed. Later give bismuth subcarbonate in large doses (2 grams or 30 grains) twice a day; later, a milk diet. Treat duodenitis and nephritis, if they occur. Order absolute rest in bed for one or two weeks, if the irritation or corrosion was severe, lest perforation from ulceration be precipitated. If an ulcer of the stomach or a stricture occurs they must be treated as usual.

## CLASS II.—IRRITANTS OF THE CENTRAL NERVOUS SYSTEM

The principal symptoms of poisoning by drugs of this class are those of irritation of the central nervous system. There is restlessness and nervous excitement; there may be, later, delirium and convulsions and, perhaps, still later, coma. The pulse is full, bounding, and generally rapid; there may even be delirium cordis or tachycardia. Respirations are increased in rapidity, the face is flushed and the skin of the body feels hot and dry, and there often is increased temperature. There may be vomiting; there often is diarrhea; there is vesical irritability, and often strangury, depending on the drug. Some drugs of the atropin series may cause vesical paresis. There are muscular twitchings; there may be cramps; and, as above stated, convulsions may occur. The pupils are of course dilated if the poisoning is by any member of the atropin series or by cocain, and they often become dilated during cerebral excitement from other members of this group.

The symptoms of poisoning by irritants of the central nervous system are:

**Immediate Symptoms:** Gastro-intestinal burning and pain, perhaps nausea and vomiting, if the poison contains an aro-

matic or volatile oil; cerebral excitement, rapid heart, rapid respiration, erythemas and flushing of the face and surface of the body.

Frequent After-Symptoms: Purging, frequent urination, muscular twitchings, delirium, convulsions, coma and failure of the circulation.

Possible Remote Symptoms: Abortion in pregnant women; albuminuria and nephritis if the poison is a renal irritant as are many of the volatile oils; prolonged sleeplessness and nervous irritability

#### TREATMENT OF POISONING BY IRRITANTS OF THE CENTRAL NERVOUS SYSTEM

Administer warm water with the antidote, if there is such.

Give an emetic. The emetics in the order of their strength are: mustard (a tablespoonful in a glass of warm water); ipecac (2 gm. [30 grains] of powdered ipecac, or a tablespoonful of the syrup); zinc sulphate (2 gm. [30 grains] dissolved in water); copper sulphate (0.50 gram [7½ grains] dissolved in water); apomorphin (1/10 of a grain given hypodermatically). Any of these emetics may be repeated in fifteen minutes if there is no satisfactory result. It should be remembered that apomorphin is depressant to the circulation.

Wash out the stomach by means of a stomach-tube, if there is no satisfactory emesis. If the vomiting is satisfactory, continue to administer warm water until the stomach washes clean.

Administer one or more nerve sedatives. The best are bromids and chloral, and the dose depends on the character of the poison. They are best administered by the rectum, at least provided nausea and vomiting is continued after the stomach has been cleared of the poison. If there is much circulatory depression, the best sedative to administer is morphin, hypodermatically, perhaps combined with scopolamin (hyoscin). An adjunct to the action of the morphin as a central nervous sedative and as a strengthener of the circulation is ergot, given intramuscularly. If there are convulsions, inhalations of chloroform are required.

Apply dry heat to the body, if the surface is cool or there is a tendency to collapse.

If heart failure occurs later in the poisoning, from shock or from the depression caused by nausea, such circulatory stimulants should be given as camphor (a saturated solution in olive oil hypodermatically); strophanthin (given hypodermatically or intravenously in a dose of 1/500 of a grain); epinephrin in aseptic ampule or 1 c.c., 15 minims, of a 1 part to 10,000 solution; or intramuscular injection of some aseptic ergot preparation (1 ampule) and repeat in an hour, if needed.

Give plenty of water with a demulcent, if there has been irritation of the stomach either from a volatile oil poisoning or from the emetic used.

### CLASS III.—DEPRESSANTS OF THE NERVOUS AND CIRCULATORY SYSTEM

The symptoms of poisoning by drugs of this class are, as their name implies, those of circulatory and nervous depression. The pulse is either slow or rapid, but generally weak; the surface of the body generally becomes cold; respirations are slowed; pupils are generally dilated unless the poison is morphin or nicotin; often the patient becomes faint; drowsiness soon develops, and if a narcotic has been taken stupor soon develops; perhaps convulsions will occur; later paralysis and coma.

**Immediate Symptoms** (if the poison is a depressant of the nervous system): Depression, drowsiness, slow, weak pulse; slowed respiration, paralysis, and coma.

**Later Symptoms:** Muscular weakness and circulatory weakness.

**Immediate Symptoms** (if the poison is a circulatory depressant): Rapid or slow, weak pulse; cardiac anxiety; cold, clammy perspiration; face pale; perhaps convulsions, and syncope.

### TREATMENT

Wash out the stomach (emetics or stomach tube, as see above).

Administer not only the chemical but a physiologic antidote, if there is such.

Apply dry heat to the body.

If the poison was a narcotic, give cerebral and nervous stimulation, as caffein (coffee), camphor, atropin, strychnin.

If the poison was a circulatory depressant, give atropin, ergot, epinephrin or strophanthin, as above described.

Compel prolonged mental, circulatory and physical rest.

The accompanying table is arranged alphabetically.

The second column gives the class to which the poison belongs, and the treatment for this class has been given under the headings of the general treatment for each class. Therefore the number of the class to which the poison belongs refers to the treatment there outlined.

Column 3 ("special symptoms") suggests symptoms of poisoning which are characteristic of the drug, such symptoms being in addition to those which are characteristic of the class of poisons to which the drug belongs.

In the fourth column ("special treatment") is indicated any chemical or physiologic antidote that is valuable in treating poisoning by the drug, and is an addition to the general rules discussed above.

TABLE OF SPECIAL SYMPTOMS AND SPECIAL TREATMENT OF VARIOUS POISONS

Name	Poison Class	Special Symptoms	Special Treatment	Remarks
Acetanilid .....	Class III.....	Cyanosis; lowered temperature....	Oxygen inhalations; artificial respiration; sodium bicarbonate.	Chronic poisoning causes anemia.
Alcohol (ethyl) ..	Class III.....	.....	.....	There may be acute delirium, in which case treat more as Class II.
Alcohol (methyl).	Class III.....	Often late unless dose is large....	Pilocarpin hydrochlorid in one-eighth gr. dose is recommended; other treatment like Class III.	More or less loss of vision by the third or fourth day.
Ammonia .....	Class I.....	May be swelling and inflammation of the bronchial tubes, hence dyspnea.	Diluted vinegar; lemon juice; olive oil; castor oil.	Stomach-tube contraindicated.
Amyl nitrite ....	Class III.....	Respiratory and cardiac failure....	Artificial respiration; Trendelenburg position.	Treatment of poisoning by other nitrites similar.
Anilin .....	Class III.....	.....	.....	See treatment for acetanilid.
Antimony .....	Class I.....	Diarrhea soon occurs; late symptoms are those of Class III; circulatory depression.	Tannic acid, one-half teaspoonful, in water; later magnesium carbonate.	If much of the poison has been absorbed, fatty degeneration of the organs may develop.
Antipyrin .....	Class III.....	Profuse sweating; lowered temperature.	Sodium bicarbonate .....	See acetanilid.
Arsenic .....	Class I.....	Frontal headache; constriction of the throat; colicky pains; eruptions on the skin.	Official antidote, ferri hydroxidum cum magnesi oxido, 3 oz.; later castor oil.	Renal inflammation is a frequent sequence.
Atropin .....	Class II.....	Flushed face; dilated pupils; dry throat; rapid heart.	Tannic acid; morphin in not too large doses as a partial physiologic antidote.	Catheterize the bladder.
Belladonna .....	Class II.....	.....	.....	See atropin.
Bromids .....	Class III.....	.....	.....	Treatment similar to chloral.
Caffein .....	Class II.....	.....	.....	.....
Camphor .....	Class II.....	.....	.....	.....
Cannabis indica..	Class II.....	.....	.....	.....



Name	Poison Class	Special Symptoms	Special Treatment	Remarks
Cantharides.....	Class I.....	Kidney and bladder irritation; strangury; abortion.		
Castor oil beans..	Class I.....	Collapse .....		See phenol.
Carbolic acid ....	Class III.....	Pupils dilated; coma.....		Inhalations of oxygen; artificial respiration; dry heat; Trendelenburg position.
Chloral .....	Class III.....	Pupils dilated; often rapid heart; often cyanosis.	Tannic acid if the drug has entered the stomach.	If collapse, Trendelenburg position; if respiratory failure, oxygen and artificial respiration.
Cocain .....	Class II.....			See morphin.
Codein .....	Class III.....			See phenol.
Creosote .....	Class III.....	Often cramp in the legs.....	Chalk; lime water; magnesia.....	Correct name, chromium trioxid.
Chromic acid ...	Class I.....			See hydrocyanic acid.
Cyanids .....	Class I and III.	May act like hydrocyanic acid; may cause stomach symptoms.		
Digitalis .....	Class III.....	The cerebrum not much affected..	Tannic acid; nitroglycerin hypodermatically.	
Ergot .....	Class III.....	Pupils dilated; cold surface of body; circulatory depression.	Alcohol; nitroglycerin .....	
Formaldehyd solution	Class I.....		If swallowed, very weak solutions of ammonia; diluted aromatic spirits of ammonia.	If inhaled or taken in strong solution, danger of edema of the glottis.
Gelsemium .....	Class III.....		Lime water; magnesia.....	Emetics and stomach-tube should not be used. Avoid chalk and alkaline carbonates.
Hydrochloric acid	Class I.....	Lips and mouth show white eschar.		
Hydrocyanic acid	Class III.....	Odor of almonds; respiration and heart fail immediately.	Patient on back with feet raised; artificial respiration; ammonia inhalations; camphor and atropin injections; wash stomach.	
Hyocyamus .....	Class II.....			See atropin.

TABLE OF SPECIAL SYMPTOMS AND SPECIAL TREATMENT OF VARIOUS POISONS—(Continued)

Iodoform .....	Class II and III	May be symptoms of nervous excitation, with fever; later, prostration.	.....	.....
Lead acetate ....	Class I.....	Colic; muscle cramps; convulsions; stupor; coma.	Dilute hydrochloric acid, a teaspoonful well diluted; magnesium or sodium sulphate 30 grams (1 ounce).	Later, multiple neuritis.
Lobelia .....	Class III.....	.....	.....	.....
Matches .....	Class I.....	.....	.....	See phosphorus.
Mercuric chlorid (cor. sublimate)	Class I.....	Convulsions; coma; collapse.....	Raw eggs and albumin water. See special article.	Late symptoms are salivation; nephritis; multiple neuritis.
Morphin .....	Class III.....	.....	.....	See opium.
Nicotin .....	Class III.....	.....	.....	See tobacco.
Nitric acid .....	Class III.....	Mouth and lips may be stained yellow.	.....	See remarks under hydrochloric acid.
Nitroglycerin ....	Class III.....	.....	.....	See amyl nitrite.
Opium .....	Class III.....	Pupils contracted; respiration slowed.	Tannic acid; atropin; wash stomach with potassium permanganate solution 1 part to 1,000.	Catheterize the bladder and wash out stomach frequently; artificial respiration as long as heart continues to beat.
Oxalic acid .....	Class I.....	Depressed circulation; cyanosis....	Magnesia; chalk; later, magnesium sulphate as cathartic.	Alkalies and alkaline carbonates are contraindicated.
Paraldehyd .....	Class III.....	.....	.....	.....
Phenacetin .....	Class III.....	Lowered temperature .....	Sodium bicarbonate .....	See acetanilid.
Phenol.....	Class III.....	If solution is strong, white eschar on lips and mouth; collapse; coma; urine black after standing.	Sodium sulphate in solution.....	Avoid all oils and fats.
Physostigma ....	Class III.....	Pupils contracted; may cause vomiting and purging.	.....	.....
Physostigmin (eserin)	Class III.....	.....	Tannic acid. Strychnin is a physiologic antidote.	See physostigma.

Phosphorus .....	Class I.....	Breath smells garlicky. Most serious symptoms sometimes slow in developing.	Use copper sulphate as emetic; wash stomach with 1-1,000 potassium permanganate solution. Later, magnesium sulphate.	Avoid all oils. If much absorption, likely to cause serious liver and kidney inflammation.
Pilocarpin .....	Class III.....	.....	Tannic acid; atropin hypoderm.	.....
Potas. chlorate...	Class I.....	.....	.....	Nephritis a frequent sequela.
Potas. hydrate...	Class I.....	.....	.....	See ammonia.
Prussic acid .....	Class III.....	.....	.....	See hydrocyanic acid.
Ratsbane .....	Class I.....	.....	.....	See phosphorus.
Resorcin .....	Class III.....	.....	.....	See phenol.
Rough-on-rats ..	Class I.....	.....	.....	See arsenic.
Salicylic acid ....	Class II.....	.....	.....	If taken in concentrated form, treat stomach as in Class I.
Salol .....	Class III.....	.....	.....	See phenol.
Santonin .....	Class III.....	.....	.....	May be delirium and convulsions.
Scopolamin .....	Class II and III.....	May act like atropin, but may cause circulatory depression.	.....	See atropin.
(hyoscin)	.....	.....	.....	.....
Silver nitrate ....	Class I.....	.....	Sodium chlorid (salt solution).....	.....
Sodium hydrate...	Class II.....	.....	.....	See ammonia.
Stramonium .....	Class III.....	.....	Nitroglycerin .....	See atropin.
Strophanthus .....	Class III.....	.....	Sodium bicarbonate; later, magnesium sulphate.	.....
Sulphonal .....	Class III.....	May cause ptosis of the eye-lids, suppression of the urine, and papular skin eruptions.	.....	Treatment quite similar to acetanilid.
Sulphuric acid ..	Class III.....	Lips and mouth may show black eschar.	.....	See remarks under hydrochloric acid.
Tobacco .....	Class III.....	Prostration .....	Tannic acid if tobacco or nicotine has been swallowed.	Trendelenburg position.
Trional .....	Class III.....	.....	.....	See sulphonal.
Veratrum .....	Class III.....	.....	.....	See aconite.
Veronal .....	Class III.....	.....	.....	See sulphonal.

# USEFUL DRUGS

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A book has been prepared by the Council on Pharmacy and Chemistry, entitled "Useful Drugs." It discusses a selected list of remedies, including only those drugs which usage has proved are efficient and reliable. A list of these drugs follows:

**Acacia.**—Acacia, U. S. P.

**Mucilago Acaciae.**—Mucilage of Acacia, U. S. P.

**Acetanilidum.**—Acetanilid, U. S. P. Dosage: 0.20 gm. or 3 grains.

**Acetphenetidinum.**—Acetphenetid, U. S. P. Dosage: 0.30 gm. or 5 grains.

**Acidum Aceticum.**—Acetic Acid, U. S. P.

**Diluted Acetic Acid,** U. S. P.

**Acidum Acetylsalicylicum.**—Aspirin. Dosage: 0.3 to 0.6 or 5 to 10 grains.

**Acidum Benzoicum.**—Benzoic Acid, U. S. P. Dosage: 0.5 gm. or 8 grains.

**Acidum Boricum.**—Boric Acid.

**Glyceritum Boroglycerini.**—Glycerite of Boroglycerin, U. S. P.

**Unguentum Acidi Borici.**—Ointment of Boric Acid, U. S. P.

**Acidum Citricum.**—Citric Acid, U. S. P. Dosage: 0.5 gm. or 8 grains.

**Acidum Hydrochloricum.**—Hydrochloric Acid, U. S. P.

**Acidum Hydrochloricum Dilutum.**—Diluted Hydrochloric Acid, U. S. P.

Dosage: 1 c.c. or 15 minims.

**Acid Nitricum.**—Nitric Acid, U. S. P.

**Acidum Phenyleinchoninicum.**—See Cinchophen, N. N. R.

**Acidum Picricum.**—See Trinitrophenol.

**Acidum Salicylicum.**—Salicylic Acid, U. S. P.

**Acidum Tannicum.**—Tannic Acid, U. S. P. Dosage: 0.5 gm. or 8 grains.

**Glyceritum Acidi Tannici.**—Glycerite of Tannic Acid, U. S. P. Dosage:

2 c.c. or 30 minims.

**Tannalbin.**—Tannalbin, N. N. R. Dosage: 2 gm. or 30 grains.

**Aconitum.**—Aconite, U. S. P.

**Tinctura Aconiti.**—Tincture of Aconite, U. S. P. Dosage: 0.2 c.c. or 3 minims.

**Adeps.**—Lard, U. S. P.

**Adeps Benzoinatus.**—Benzoinated Lard, U. S. P.

**Adeps Lanae Hydrosus.**—Hydrous Wool Fat, U. S. P.

**Adrenalin.**—See Epinephrine.

**Aether.**—Ether, U. S. P. Dosage: 1 c.c. or 15 minims.

**Spiritus Aetheris,** U. S. P. Dosage: 4 c.c. or 1 fluidram.

**Aether Nitrosus.**—Used only in the form of

**Spiritus Aetheris Nitrosi.**—Spirit of Nitrous Ether, U. S. P. Dosage: 2 c.c. or 30 minims.

**Aethylis Chloridum.**—Ethyl Chloride, U. S. P.

**Aethyl-Morphinae Hydrochloridum.**—Ethyl-Morphin Hydrochloride, N. N. R. Dionin. Dosage: 0.015 gm. or  $\frac{1}{4}$  grain.

**Alcohol.**—Alcohol, U. S. P.

**Elixir Aromaticum.**—Aromatic Elixir, U. S. P.

**Aloes.**—Aloe, U. S. P. Dosage: 0.15 to 0.3 gm. or 2 to 5 grains, purgative; 0.03 to 0.05 gm. or  $\frac{1}{2}$  to 1 grain, laxative.

**Extractum Aloes.**—Extract of Aloes, U. S. P. Dosage: 0.125 gm. or 2 grains.

**Aloinum.**—Aloin, U. S. P. Dosage: 0.015 gm. or  $\frac{1}{4}$  grain.

**Alumen.**—Alum, U. S. P.

**Alumen Exsiccatum.**—Exsiccated Alum, U. S. P.

**Alumini Acetas.**—Aluminum Acetate.

**Liquor Alumini Acetatis.**—Solution of Aluminum Acetate, N. F.

**Ammonia.**

**Aqua Ammoniae.**—Ammonia Water, U. S. P.

**Linimentum Ammoniae.**—Ammonia Liniment, U. S. P.

**Ammonii Carbonas.**—Ammonium Carbonate, U. S. P. Dosage: 0.3 gm. or 5 grains.

**Spiritus Ammoniae Aromaticus.**—Aromatic Spirit of Ammonia, U. S. P.

Dosage: 1 to 5 c.c. or 15 to 60 minims.

**Ammonii Chloridum.**—Ammonium Chloride, U. S. P. Dosage: 0.30 to 1 gm. or 5 to 15 grains.

**Amylis Nitris.**—Amyl Nitrite, U. S. P. Dosage: 0.2 c.c. or 3 minims, by inhalation.

**Amylum.**—Starch, Corn Starch, U. S. P.

**Antimonii et Potassii Tartras.**—Antimony and Potassium Tartrate, U. S. P.

Dosage: 0.001 gm. or 1/60 grain.

**Antipyrina.**—Antipyrine, U. S. P. Dosage: 0.25 gm. or 4 grains

**Apomorphinae Hydrochloridum.**—Apomorphine Hydrochloride, U. S. P.

Dosage: expectorant 0.002 gm. or 1/30 grain, emetic 0.0005 gm. or 1/10 grain.

**Aqua.**—Water, U. S. P.

**Aqua Destillata.**—Distilled Water, U. S. P.

**Argenti Nitras.**—Silver Nitrate, U. S. P. Dosage: 0.01 gm. or 1/5 grain.

**Argenti Nitras Fusus.**—Molded Silver Nitrate, U. S. P.

**Argenti Proteinat.**—Silver Proteinate. See Argyrol and Protargol, N. N. R.

**Aristol.**—See Thymolis Iodidum.

**Arseni Trioxidum.**—Arsenic Trioxide, U. S. P. Dosage: 0.002 gm. or 1/30 grain.

**Liquor Acidi Arsenosi.**—Solution of Arsenous Acid, U. S. P. Dosage: 0.2 c.c. or 3 minims.

**Liquor Arseni et Hydrargyri Iodidi.**—Solution of Arsenous and Mercuric Iodids, U. S. P. Dosage: 0.1 c.c. or 1½ minims.

**Liquor Potassii Arsenitis.**—Solution of potassium Arsenite, U. S. P. Dosage: 0.2 c.c. or 3 minims.

**Arsphenamina.**—Arsphenamin, N. N. R. Dosage: 0.3 to 0.6 gm. or 5 to 9 grains.

**Neoarsphenamina.**—Neoarsphenamin, N. N. R. Dosage: 0.6 to 0.9 gm. or 9 to 14 grains.

**Asafoetida.**—Asafetida, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Aspidium.**—Aspidium, U. S. P.

**Oleoresina Aspidii.**—Oleoresin of Aspidium, U. S. P. Dosage: 2 gm. or 30 grains.

**Aspirin.**—Aspirin, N. N. R. Dosage: 0.3 to 1 gm. or 5 to 15 grains.

**Atophan.**—See Cincophen, N. N. R.

**Atropina.**—Atropine, U. S. P. Dosage: 0.00025 gm. or 1/250 gr.

**Atropinae Sulphas.**—Atropine Sulphate, U. S. P. Dosage: 0.4 mg. or 1/160 grain.

**Balsamum Peruvianum.**—Balsam of Peru, U. S. P.

**Balsamum Tolutanum.**—Balsam of Tolu, U. S. P.

**Syrupus Tolutanus.**—Syrup of Tolu, U. S. P. Dosage: 16 c.c. or 4 fluidrams.

**Barbital.**—Barbital, N. N. R. Dosage: 0.3 to 0.6 gm. or 5 to 10 grains.

**Barbital Sodium.**—Sodii Barbital, N. N. R. Dosage: 0.3 to 0.6 gm. or 5 to 10 grains.

**Belladonnae Folia.**—Belladonna Leaves, U. S. P.

**Tinctura Belladonnae Foliorum.**—Tincture of Belladonna Leaves, U. S. P. Dosage: 0.5 c.c. or 8 minims.

**Extractum Belladonnae Foliorum.**—Extract of Belladonna Leaves, U. S. P. Dosage: 0.01 gm. or 1/5 grain.

**Emplastrum Belladonnae.**—Belladonna Plaster, U. S. P.

**Unguentum Belladonnae.**—Belladonna Ointment, U. S. P.



- Benzoinum.**—Benzoin, U. S. P.
- Tinctura Benzoinae Composita.**—Compound Tincture of Benzoin, U. S. P.
- Benzosulphinidum.**—Benzosulphinide, Saccharin, U. S. P. Dosage: 0.2 gm. or 3 grains.
- Betanaphthol.**—Betanaphthol, U. S. P. Dosage: 0.1 to 0.3 gm. or 2 to 5 grains.
- Bismuthi Subcarbonas.**—Bismuth Subcarbonate, U. S. P. Dosage: 1 gm. or 15 grains.
- Bismuthi Subgallas.**—Bismuth Subgallate, U. S. P. Dosage: 0.25 gm. or 4 grains.
- Bismuthi Subnitrates.**—Bismuth Subnitrate, U. S. P. Dosage: 1 gm. or 15 grains.
- Bismuthi Subsalicylas.**—Bismuth Subsalicylate, U. S. P. Dosage: 0.25 gm. or 4 grains.
- Caffeina.**—Caffeine, U. S. P. Dosage: 0.06 gm. to 0.3 gm. or 1 to 5 grains.
- Caffeina Citrata.**—Citric Acid Caffeine, U. S. P. Dosage: 0.1 gm. or 2 grains.
- Caffeinae Sodio-Benzoes.**—Caffeine Sodio-Benzoesate, N. F. Dosage: 0.10 gm. or 2 grains.
- Calcii Carbonas Praecipitatus.**—Precipitated Calcium Carbonate, U. S. P. Dosage: 1 to 3 gm. or 15 to 45 grains.
- Calcii Chloridum.**—Calcium Chloride, U. S. P. Dosage: 0.5 gm. or 7½ grains.
- Calcii Lactas.**—Calcium Lactate, N. N. R. Dosage: 0.5 gm. or 7½ grains.
- Calx.**—Calcium Oxide, U. S. P.
- Liquor Calcis.**—Solution of Calcium Hydroxide, U. S. P. Dosage: 15 c.c. or 4 fluidrams.
- Linimentum Calcis.**—Lime Liniment, U. S. P.
- Calx Chlorinata.**—Chlorinated Lime, Chlorinated Calcium Oxide, U. S. P.
- Liquor Sodae Chlorinatae.**—Solution of Chlorinated Soda, U. S. P. Dosage: 1 c.c. or 15 minims.
- Camphora.**—Camphor, U. S. P. Dosage: 0.10 gm. or about 2 grains.
- Aqua Camphorae.**—Camphor Water, U. S. P. Dosage: 10 c.c. or 2 fluidrams.
- Spiritus Camphorae.**—Spirit of Camphor, U. S. P. Dosage: 1 c.c. or 15 minims.
- Linimentum Camphorae.**—Camphor Liniment, U. S. P.
- Cantharis.**—Cantharides, U. S. P.
- Ceratum Cantharidis.**—Cantharides Cerate, U. S. P.
- Tinctura Cantharidis.**—Tincture of Cantharides, U. S. P. Dosage: 0.1 c.c. or 1½ minims.
- Capsicum.**—Capsicum, U. S. P. Dosage: 0.05 gm. or about 1 grain.
- Tinctura Capsici.**—Tincture of Capsicum, U. S. P. Dosage: 0.5 c.c. or 7½ minims.
- Carbo Ligni.**—Charcoal, U. S. P. Dosage: 1 gm. or 15 grains.
- Cardamomum.**—Cardamom, U. S. P.
- Tinctura Cardamomi.**—Tincture of Cardamom, U. S. P. Dosage: 5 c.c. or 1 fluidram.
- Caryophyllus.**—Cloves, U. S. P.
- Oleum Caryophylli.**—Oil of Cloves, U. S. P. Dosage: 0.2 c.c. or 3 minims.
- Cascara Sagrada.**—Cascara Sagrada, U. S. P.
- Fluidextractum Cascarae Sagradae.**—Fluidextract of Cascara Sagrada, U. S. P. Dosage: 1 c.c. or 15 minims.
- Fluidextractum Cascarae Sagradae Aromaticum.**—Aromatic Fluidextract of Cascara Sagrada, U. S. P. Dosage: 2 c.c. or 10 to 30 minims.
- Extractum Cascarae Sagradae.**—Extract of Cascara Sagrada, U. S. P. Dosage: 5 gm. or 2 to 8 grains.
- Cera Alba.**—White Wax, U. S. P., is the bleached form of
- Cera Flava.**—Yellow Wax, U. S. P.
- Chenopodii Oleum.**—Oil of Chenopodium, U. S. P. Dosage: 0.2 c.c. or 3 minims.

- Chloralum Hydratum.**—Hydrated Chloral, U. S. P. Dosage: 0.30 to 1.30 gm. or 5 to 20 grains.
- Chloramin-T.**—Sodium Paratoluenesulphochloramid, N. N. R.
- Chloroform.**—Chloroform, U. S. P. Dosage: 0.05 to 0.3 c.c. or 1 to 5 minims.
- Aqua Chloroformi.**—Chloroform Water, U. S. P. Dosage: 15 c.c. or 4 fluidrams.
- Spiritus Chloroformi.**—Spirit of Chloroform, U. S. P. Dosage: 2 c.c. or 30 minims.
- Linimentum Chloroformi.**—Chloroform Liniment, U. S. P.
- Chromii Trioxidum.**—Chromium Trioxide, U. S. P.
- Chrysarobinum.**—Chrysarobin, U. S. P.
- Unguentum Chrysarobini.**—Chrysarobin Ointment, U. S. P.
- Cinchona.**—Cinchona, U. S. P.
- Tinctura Cinchonae.**—Tincture of Cinchona, U. S. P. Dosage: 4 c.c. or 1 fluidram.
- Tinctura Cinchonae Composita.**—Compound Tincture of Cinchona, U. S. P. Dosage: 4 c.c. or 1 fluidram.
- Cinnamomum.**—Cinnamon, U. S. P.
- Oleum Cassiae.**—Oil of Cinnamon, U. S. P. Dosage: 0.05 c.c. or 1 minim.
- Aqua Cinnamomi.**—Cinnamon Water, U. S. P. Dosage: 15 c.c. or 4 fluidrams.
- Cocaina.**—Cocaine, U. S. P. Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Cocaina Hydrochloridum.**—Cocaine Hydrochloride, U. S. P. Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Codeina.**—Codeine, U. S. P. Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Codeinae Phosphas.**—Codeine Phosphate, U. S. P. Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Codeinae Sulphas.**—Codeine Sulphate, U. S. P. Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Colchici Semen.**—Colchicum Seed, U. S. P.
- Tinctura Colchici Seminis.**—Tincture of Colchicum Seed, U. S. P. Dosage: 2 c.c. or 30 minims.
- Collodium.**—Collodion, U. S. P.
- Collodium Flexile.**—Flexible Collodion, U. S. P.
- Colocynthis.**—Colocynth, U. S. P.
- Extractum Colocynthis.**—Extract of Colocynth, U. S. P. Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Extractum Colocynthis Compositum.**—Compound Extract of Colocynth, U. S. P. Dosage: 0.5 gm. or  $7\frac{1}{2}$  grains.
- Copaiba.**—Copaiba, U. S. P. Dosage: 1 c.c. or 15 minims.
- Creosotum.**—Creosote, U. S. P. Dosage: 0.2 c.c. or 3 minims.
- Cresol.**—Cresol, U. S. P. Dosage: 0.05 c.c. or 1 minim.
- Liquor Cresolis Compositus.**—Compound Solution of Cresol, U. S. P. Dosage: Solutions containing 1 to 5 per cent.
- Cupri Sulphas.**—Copper Sulphate, U. S. P. Dosage: 0.01 gm. or  $\frac{1}{5}$  grain, astringent; 0.3 gm. or 5 grains (not repeated), emetic.
- Dichloramin-T.**—Paratoluenesulphondichloramid, N. N. R.
- Digitalis.**—Digitalis, U. S. P. Dosage: 0.065 gm. or 1 grain.
- Infusum Digitalis.**—Infusion of Digitalis, U. S. P. Dosage: 8 c.c. or 2 fluidrams.
- Tinctura Digitalis.**—Tincture of Digitalis, U. S. P. Dosage: 1 c.c. or 15 minims.
- Diphtheria Antitoxin.**—See Serum Antidiphthericum.
- Elaterinum.**—Elaterin, U. S. P. Dosage: 0.005 gm. or  $\frac{1}{10}$  grain.
- Trituratio Elaterini.**—Dosage: 0.03 gm. or  $\frac{1}{2}$  grain.
- Emetinae Hydrochloridum.**—Emetine Hydrochloride, U. S. P. Dosage: 0.03 to 0.45 gm. or from  $\frac{1}{2}$  to  $\frac{3}{4}$  grain as an amebicide;  $\frac{1}{12}$  to  $\frac{1}{16}$  grain as an expectorant.
- Epinephrine.**—Epinephrine, N. N. R. Dosage: 1:10,000 to 1:1,000. Internally, 5 to 10 drops of 1:1,000 solution.

- Ergota.**—Ergot, U. S. P. Dosage: 2 gm. or 30 grains.  
**Fluidextractum Ergotae.**—Fluidextract of Ergot, U. S. P. Dosage: 2 c.c. or 30 minims.
- Eucalyptus.**—Eucalyptus, U. S. P.  
**Eucalyptol.**—Eucalyptol, U. S. P. Dosage: 0.3 c.c. or 5 minims.  
**Oleum Eucalypti.**—Oil of Eucalyptus, U. S. P. Dosage: 0.5 c.c. or 8 minims.
- Fel Bovis.**—Oxgall, U. S. P.  
**Extractum Fellis Bovis.**—Extract of Oxgall, U. S. P. Dosage: 0.1 gm. or 1½ grains.
- Ferri Carbonas.**—Ferrous Carbonate.  
**Massa Ferri Carbonatis.**—Mass of Ferrous Carbonate, U. S. P. Dosage: 0.25 gm. or 4 grains.  
**Pilulae Ferri Carbonatis.**—Pills of Ferrous Carbonate, U. S. P. Dosage: 2 pills.
- Ferri Chloridum.**—Ferric Chloride, U. S. P.  
**Tinctura Ferri Chloridi.**—Tincture of Ferric Chloride, U. S. P. Dosage: 0.5 c.c. or 8 minims.
- Ferri et Ammonii Citras.**—Iron and Ammonium Citrate, U. S. P. Dosage: 0.25 gm. or 4 grains.
- Ferri Iodidum.**—Ferrous Iodide.  
**Syrupus Ferri Iodidi.**—Syrup of Ferrous Iodide, U. S. P. Dosage: 1 c.c. or 15 minims.
- Ferri Phosphas Solubilis.**—Soluble Ferric Phosphate, U. S. P. Dosage: 0.25 gm. or 4 grains.
- Ferri Sulphas.**—Ferrous Sulphate, U. S. P. Dosage: 0.2 gm. or 3 grains.  
**Ferri Sulphas Exsiccatus.**—Exsiccated Ferrous Sulphate, U. S. P.
- Ferrum.**—Iron, U. S. P.  
**Ferrum Reductum.**—Reduced Iron, U. S. P. Dosage: 0.06 gm. or 1 grain.
- Formaldehydum.**—Formaldehyde.  
**Liquor Formaldehydi.**—Solution of Formaldehyde, U. S. P.
- Gelatinum.**—Gelatin, U. S. P.
- Gentiana.**—Gentian, U. S. P.  
**Tinctura Gentianae Composita.**—Compound Tincture of Gentian, U. S. P. Dosage: 4 c.c. or 1 fluidram.  
**Extractum Gentianae.**—Extract of Gentian, U. S. P. Dosage: 0.25 gm. or 4 grains.
- Glycerinum.**—Glycerin, U. S. P.  
**Suppositoria Glycerini.**—Suppositories of Glycerin, U. S. P.
- Glycerylis Nitrates.**—Glyceryl Trinitrate.  
**Spiritus Glycerylis Nitratis.**—Spirit of Glyceryl Trinitrate, U. S. P. Dosage: 0.05 c.c. or 1 minim
- Glycyrrhiza.**—Glycyrrhiza, Licorice Root, U. S. P.  
**Fluidextractum Glycyrrhizae.**—Fluidextract of Glycyrrhiza, U. S. P. Dosage: 2 c.c. or 30 minims.  
**Pulvis Glycyrrhizae Compositus.**—Compound Powder of Glycyrrhiza, U. S. P. Dosage: 4 gm. or 60 grains.
- Guaiacol.**—Guaiacol, U. S. P. Dosage: 0.1 to 0.6 c.c. or 1½ minims to 10 minims.
- Guaicolis Carbonas.**—Guaiacol Carbonate, U. S. P. Dosage: 1 gm. or 15 grains.
- Hexamethylenamina.**—Hexamethylenamine, U. S. P. Dosage: 0.3 gm. or 5 grains.
- Homatropinae Hydrobromidum.**—Homatropine Hydrobromide, U. S. P. Dosage: 0.0005 gm. or 1/125 grain.
- Hydrargyri Chloridum Corrosivum.**—Corrosive Mercuric Chloride, U. S. P. Dosage: 0.002 to 0.01 gm. or 1/30 to 1/6 grain.
- Hydrargyri Chloridum Mite.**—Mild Mercurous Chloride, U. S. P. Dosage: 0.005 to 0.02 gm. or 1/10 to 1/3 grain.
- Hydrargyri Iodidum Flavum.**—Yellow Mercurous Iodide, U. S. P. Dosage: 0.015 gm. or ¼ grain.

- Hydrargyri Iodidum Rubrum.**—Red Mercuric Iodide, U. S. P. Dosage: 0.003 or 1/20 grain.
- Hydrargyri Oxidum Flavum.**—Yellow Mercuric Oxide, U. S. P. Dosage: 0.5 to 2 per cent. ointment.
- Unguentum Hydrargyri Oxidi Flavi.**—Ointment of Yellow Mercuric Oxide, U. S. P. Dosage: It should be diluted with from 10 to 100 parts of petrolatum.
- Hydrargyri Salicylas.**—Mercuric Salicylate, N. N. R. Dosage: 0.6 c.c. or 10 minims of a 10 per cent. suspension in liquid paraffin.
- Hydrargyrum.**—Mercury, U. S. P.
- Hydrargyrum cum Creta.**—Mercury with Chalk, U. S. P. Dosage: 0.250 gm. or 4 grains.
- Massa Hydrargyri.**—Mass of Mercury, U. S. P. Dosage: 0.250 gm. or 4 grains.
- Unguentum Hydrargyri.**—Mercurial Ointment, U. S. P.
- Unguentum Hydrargyri Dilutum.**—Blue Ointment, U. S. P. Dosage: 2 gm. or 30 grains.
- Hydrargyrum Ammoniatum.**—Ammoniated Mercury, U. S. P.
- Unguentum Hydrargyri Ammoniatum.**—Ointment of Ammoniated Mercury, U. S. P.
- Hydrastininæ Hydrochloridum.**—Hydrastinin Hydrochlorid, U. S. P. Dosage 0.03 gm. or ½ grain.
- Hydrastis.**—Hydrastis, U. S. P.
- Fluidextractum Hydrastis.**—Fluidextract of Hydrastis, U. S. P. Dosage: 2 c.c. or 30 minims.
- Hydrogenii Dioxidum.**—Hydrogen Dioxide.
- Liquor Hydrogenii Dioxidum.**—Solution of Hydrogen Dioxide, U. S. P. Dosage: Apply diluted with four volumes of water.
- Hyoscyamus.**—Hyoscyamus, U. S. P.
- Tinctura Hyoscyami.**—Tincture of Hyoscyamus, U. S. P. Dosage: 0.6 to 2 c.c. or 10 to 30 minims.
- Hypophysis Sicca.**—Dessicated Hypophysis, U. S. P.
- Liquor Hypophysis.**—Solution of Hypophysis, U. S. P. Dosage: 1 c.c. or 15 minims.
- Ichthyol.**—Ichthyol, N. N. R. Dosage: 0.2 to 2 c.c. of 3 to 30 minims.
- Iodoformum.**—Iodoform, U. S. P. Dosage: 0.25 gm. or 4 grains.
- Iodum.**—Iodine, U. S. P.
- Tinctura Iodi.**—Tincture of Iodine, U. S. P. Dosage: 0.1 c.c. or 1½ minims.
- Ipecacuanha.**—Ipecac, U. S. P. Dosage: 0.05 gm. or 1 grain, expectorant; 1 gm. or 15 grains, emetic.
- Fluidextractum Ipecacuanhae.**—Fluidextract of Ipecac, U. S. P. Dosage: 1 c.c. or 15 minims, emetic; 0.05 c.c. or 1 minim, expectorant.
- Syrupus Ipecacuanhae.**—Syrup of Ipecac, U. S. P. Dosage: 0.25 c.c. or 4 minims, expectorant; 15 c.c. or 4 fluidrams, emetic.
- Jalap.**—Jalap, U. S. P. Dosage: 1 gm. or 15 grains.
- Pulvis Jalapae Compositus.**—Compound Powder of Jalap, U. S. P. Dosage: 2 gm. or 30 grains.
- Linum.**—Flaxseed, U. S. P.
- Oleum Lini.**—Linseed Oil, U. S. P. Dosage: 30 c.c. or 1 fluidounce.
- Lobelia.**—Lobelia, U. S. P.
- Tinctura Lobeliae.**—Tincture of Lobelia, U. S. P. Dosage: 0.5 c.c. to 1.5 c.c. or 10 to 20 minims.
- Magnesii Carbonas.**—Magnesium Carbonate, U. S. P. Dosage: 3 gm. or 45 grains.
- Magnesii Citras.**—Magnesium Citrate.
- Liquor Magnesii Citratis.**—Solution of Magnesium Citrate, U. S. P. Dosage: 360 c.c. or 12 fluidounces.
- Magnesii Oxidum.**—Magnesium Oxide, U. S. P. Dosage: 0.6 to 3 gm. or 10 to 45 grains.
- Magnesii Sulphas.**—Magnesium Sulphate, U. S. P. Dosage: 15 gm. or 240 grains.

**Mentha Piperita.**—Peppermint, U. S. P.

**Oleum Menthae Piperitae.**—Oil of Peppermint, U. S. P. Dosage: 0.2 c.c. or 3 minims.

**Spiritus Menthae Piperitae.**—Spirit of Peppermint, U. S. P. Dosage: 2 c.c. or 30 minims.

**Aqua Menthae Piperitae.**—Peppermint Water, U. S. P. Dosage: 16 c.c. or 4 fluidrams.

**Menthol.**—Menthol, U. S. P. Dosage: 0.065 gm. or 1 grain.

**Methylis Salicylas.**—Methyl Salicylate, U. S. P. Dosage: 1 c.c. or 15 minims.

**Morphina.**—Morphine, U. S. P. Dosage: 0.01 gm. or 1/6 grain.

**Morphinae Hydrochloridum.**—Morphine Hydrochloride, U. S. P. Dosage: 0.01 gm. or 1/6 grain.

**Morphinae Sulphas.**—Morphine Sulphate, U. S. P. Dosage: 0.01 gm. or 1/6 grain.

**Myrrha.**—Myrrh, U. S. P. Dosage: 0.5 gm. or 7½ grains.

**Tinctura Myrrhae.**—Tincture of Myrrh, U. S. P. Dosage: 1 c.c. or 15 minims.

**Novocain.**—See Procain.

**Nux Vomica.**—Nux Vomica, U. S. P.

**Extractum Nucis Vomicae.**—Extract of Nux Vomica, U. S. P. Dosage: 0.015 gm. or ¼ grain.

**Tinctura Nucis Vomicae.**—Tincture of Nux Vomica, U. S. P. Dosage: 0.6 c.c. or 10 minims.

**Oleum Moorhuae.**—Cod-Liver Oil, U. S. P. Dosage: 4 to 30 c.c. or 1 dram to 1 fluidounce.

**Oleum Ricini.**—Castor Oil, U. S. P. Dosage: 15 c.c. or 4 fluidrams.

**Oleum Santali.**—Oil of Santal, U. S. P. Dosage: 0.5 c.c. or 8 minims.

**Oleum Theobromatis.**—Oil of Theobroma, U. S. P. Cacao Butter.

**Oleum Tigllii.**—Croton Oil, U. S. P. Dosage: 0.05 c.c. or 1 minim.

**Opium.**—Opium, U. S. P.

**Opil Pulvis.**—Powdered Opium, U. S. P. Dosage: 0.065 gm. or 1 grain.

**Extractum Opil.**—Extract of Opium, U. S. P. Dosage: 0.03 gm. or ½ grain.

**Tinctura Opil.**—Tincture of Opium, Laudanum, U. S. P. Dosage: 0.5 c.c. or 8 minims.

**Tinctura Opil Deodorati.**—Tinctura of Deodorized Opium, U. S. P. Dosage: 0.5 c.c. or 8 minims.

**Tinctura Opil Camphorata.**—Camphorated Tincture of Opium, Paregoric, U. S. P. Dosage: 8 c.c. or 2 fluidrams.

**Pulvis Ipecacuanhae et Opil.**—Powder of Ipecac and Opium, U. S. P. Dosage: 0.5 gm. or 7½ grains.

**Oxygenium.**—Oxygen, U. S. P.

**Pancreatinum.**—Pancreatin, U. S. P. Dosage: 0.5 gm. or 7½ grains.

**Paraffinum.**—Paraffin, U. S. P.

**Paraldehydum.**—Paraldehyde, U. S. P. Dosage: 2 c.c. or 30 minims.

**Pelletierinae Tannas.**—Pelletierine Tannate, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Pepsinum.**—Pepsin, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Petrolatum.**—Petrolatum, U. S. P.

**Petrolatum Liquidum.**—Liquid Petrolatum, U. S. P.

**Phenol.**—Phenol, U. S. P.

**Phenol Liquefactum.**—Liquefied Phenol, U. S. P. Dosage: 0.05 c.c. or 1 minim.

**Phenolphthalein.**—Phenolphthalein, N. N. R. Dosage: 0.05 to 0.5 gm. or 1 to 8 grains.

**Phenylis Salicylas.**—Phenyl Salicylate, U. S. P. Dosage: 0.2 to 0.5 gm. or 3 to 8 grains.

**Phosphorus.**—Phosphorus, U. S. P. Dosage: 0.5 mg. or 1/125 grain.

**Physostigma.**—Physostigma, U. S. P.

**Physostigminae Salicylas.**—Physostigmine Salicylate, U. S. P. Dosage: 1 mg. or 1/60 grain.



**Pilocarpus.**—Pilocarpus, U. S. P.

**Pilocarpinae Hydrochloridum.**—Pilocarpine Hydrochloride, U. S. P.  
Dosage: 1.001 to 0.01 gm. or 1/60 to 1/6 grain.

**Pilocarpinae Nitras.**—Pilocarpine Nitrate, U. S. P. Dosage: 0.1 gm. or 1/5 grain.

**Pix Liquida.**—Tar, U. S. P.

**Unguentum Picis Liquidæ.**—Tar Ointment, U. S. P.

**Plumbi Acetas.**—Lead Acetate, U. S. P. Dosage: 0.065 gm. or 1 grain.

**Liquor Plumbi Subacetatis.**—Solution of Lead Subacetate, U. S. P.

**Podophyllum.**—Podophyllum, U. S. P.

**Resina Podophylli.**—Resin of Podophyllum, U. S. P. Dosage: 0.003 to 0.006 gm. or 1/20 to 1/10 grain.

**Potassii Acetas.**—Potassium Acetate, U. S. P. Dosage: 2 gm. or 30 grains.

**Potassii Bicarbonas.**—Potassium Bicarbonate, U. S. P. Dosage: 2 gm. or 30 grains.

**Potassii Bitartras.**—Potassium Bitartrate, U. S. P. Dosage: 2 gm. or 30 grains.

**Potassii Bromidum.**—Potassium Bromide, U. S. P. Dosage: 1 gm. or 15 grains.

**Potassii Carbonas.**—Potassium Carbonate, U. S. P. Dosage: 1 gm. or 15 grains, well diluted.

**Potassii Chloras.**—Potassium Chlorate, U. S. P. Dosage: Saturated solution may be used as mouth wash or gargle.

**Potassii Citras.**—Potassium Citrate, U. S. P. Dosage: 1 gm. or 15 grains.

**Potassii Citras Effervescens.**—Effervescent Potassium Citrate, U. S. P.  
Dosage: 4 gm. or 60 grains.

**Potassii et Sodii Tartras.**—Potassium and Sodium Tartrate, U. S. P.  
Dosage: 8 gm. or 120 grains.

**Pulvis Effervescens Compositus.**—Seidlitz Powder, U. S. P. Dosage: One set of two papers.

**Potassii Hydroxidum.**—Potassium Hydroxide, U. S. P.

**Liquor Potassii Hydroxidi.**—Solution of Potassium Hydroxide, U. S. P.  
Dosage: 1 c.c. or 15 minims.

**Potassii Iodidum.**—Potassium Iodide, U. S. P. Dosage: 0.3 to 2 gm. or 5 to 30 grains.

**Potassii Permanganas.**—Potassium Permanganate, U. S. P. Dosage: 0.03 to 0.06 gm. or 1/2 to 1 grain.

**Procaïn.**—Procaïn, N. N. R. For local anesthesia.

**Protargol.**—Protargol, N. N. R., Silver Proteinat. Dosage: 1.2,000 to 1 per cent solutions.

**Prunus Virginiana.**—Wild Cherry, U. S. P.

**Syrupus Pruni Virginianæ.**—Syrup of Wild Cherry, U. S. P. Dosage: 5 c.c. or 1 fluidram.

**Quinina.**—Quinine, U. S. P. Dosage: 0.25 gm. or 4 grains

**Quininae Bisulphas.**—Quinine Bisulphate, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Quininae Hydrochloridum.**—Quinine Hydrochloride, U. S. P. Dosage: 0.25 or 4 grains.

**Quininae Sulphas.**—Quinine Sulphate, U. S. P. Dosage: 0.25 or 4 grains.

**Quininae Tannas.**—Quinine Tannate, N. N. R. Dosage: 0.5 gm. or 7 1/2 grains.

**Quininae et Ureae Hydrochloridum.**—Quinine and Urea Hydrochloride, N. N. R. Dosage: 0.25 gm. or 4 grains.

**Resorcinol.**—Resorcinol, U. S. P. Dosage: 0.125 gm. or 2 grains.

**Rheum.**—Rhubarb, U. S. P. Dosage: 1 gm. or 15 grains.

**Extractum Rhei.**—Extract of Rhubarb, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Tinctura Rhei Aromatica.**—Aromatic Tincture of Rhubarb, U. S. P. Dosage: 2 c.c. or 30 minims.

**Syrupus Rhei Aromaticus.**—Aromatic Syrup of Rhubarb, U. S. P. Dosage: 8 c.c. or 2 fluidrams.

**Rosa.**—Rose.

**Aqua Rosae.**—Rose Water, U. S. P.

**Saccharum.**—Sugar, U. S. P.

**Syrupus.**—Syrup, U. S. P.

**Saccharum Lactis.**—Sugar of Milk, U. S. P.

**Salvarsan.**—See Arsphenamine.

**Santoninum.**—Santonin, U. S. P. Dosage: 0.065 gm. or 1 grain.

**Sapo.**—Soap, U. S. P.

**Linimentum Saponis.**—Soap Liniment, U. S. P.

**Sapo Mollis.**—Soft Soap, U. S. P.

**Scilla.**—Squill, U. S. P. Dosage: 0.125 gm. or 2 grains.

**Tinctura Scillae.**—Tincture of Squill, U. S. P. Dosage: 1 c.c. or 15 minims.

**Syrupus Scillae.**—Syrup of Squill, U. S. P. Dosage: 2 c.c. or 30 minims.

**Scopolaminae Hydrobromidum.**—Scopolamine Hydrobromide, U. S. P. Dosage: 0.5 mg. or 1/125 grain.

**Senna.**—Senna, U. S. P. Dosage: 4 gm. or 60 grains.

**Fluidextractum Sennae.**—Fluidextract of Senna, U. S. P. Dosage: 2 c.c. or 30 minims.

**Syrupus Sennae.**—Syrup of Senna, U. S. P. Dosage: 4 c.c. or 1 fluidram.

**Serum Antidiphthericum.**—Antidiphtheric Serum, Diphtheria Antitoxin, U. S. P. Dosage: Immunizing, 500 to 1,000 units; curative, 10,000 units.

**Serum Antidiphthericum Purificatum.**—Purified Antidiphtheria Serum, U. S. P.

**Serum Antidiphthericum Siccum.**—Dried Antidiphtheria Serum, U. S. P.

**Serum Antimeningococcicum.**—Antimeningococcus Serum. Dosage: 5 c.c. to 30 c.c.

**Serum Antitetanicum.**—Antitetanic Serum, U. S. P. Dosage: Immunizing, 1,500 units; in tetanus, 3,000 to 20,000 units.

**Serum Antitetanicum Purificatum.**—Purified Antitetanic Serum, U. S. P.

**Serum Antitetanicum Siccum.**—Dried Antitetanic Serum, U. S. P.

**Sinapis.**—Mustard.

**Sinapis Nigra.**—Black Mustard, U. S. P. Dosage: 8 gm. or 120 grains.

**Emplastrum Sinapis.**—Mustard Plaster, U. S. P.

**Oleum Sinapis Volatile.**—Volatile Oil of Mustard, U. S. P. Dosage: 0.008 c.c. or 1/2 minim.

**Sodii Arsanilas.**—Sodium Arsanilate, N. N. R. Dosage: 0.02 gm. or 1/3 grain.

**Sodii Arsenas.**—Sodium Arsenate, U. S. P. Dosage: 5 mg. or 1/10 grain.

**Sodii Benzoas.**—Sodium Benzoate, U. S. P. Dosage: 1 gm. or 15 grains.

**Sodii Bicarbonas.**—Sodium Bicarbonate, U. S. P. Dosage: 1 gm. or 15 grains.

**Sodii Biphosphas.**—Sodium Acid Phosphate, N. N. R. (to be added). Dosage: 1 to 1.5 gm. or 15 to 20 grains.

**Sodii Boras.**—Sodium Borate, U. S. P. Dosage: 0.5 gm. or 7 1/2 grains.

**Sodii Bromidum.**—Sodium Bromide, U. S. P. Dosage: 1 gm. or 15 grains.

**Sodii Cacodylas.**—Sodium Cacodylate, N. N. R. Dosage: 0.03 gm. or 1/2 grain.

**Sodii Carbonas Monohydratus.**—Monohydrated Sodium Carbonate, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Sodii Chloridum.**—Sodium Chloride, U. S. P. Dosage: 16 gm. or 240 grains, emetic; 4 gm. or 60 grains, laxative.

**Sodii Hydroxidum.**—Sodium Hydroxide, U. S. P.

**Liquor Sodii Hydroxidi.**—Solution of Sodium Hydroxide, U. S. P. Dosage: 1 c.c. or 15 minims.

**Sodii Iodidum.**—Sodium Iodide, U. S. P. Dosage: 0.5 gm. or 7 1/2 grains.

**Sodii Nitris.**—Sodium Nitrate, U. S. P. Dosage: 0.065 or 1 grain.

**Sodii Phosphas.**—Sodium Phosphate, U. S. P. Dosage: 2 gm. or 30 grains.

**Sodii Phosphas Effervescens.**—Effervescent Sodium Phosphate, U. S. P. Dosage: 8 gm. or 120 grains.

**Sodii Salicylas.**—Sodium Salicylate, U. S. P. Dosage: 1 gm. or 15 grains.

**Sodii Sulphas.**—Sodium Sulphate, U. S. P. Dosage: 16 gm. or 240 grains.

**Sodii Sulphis.**—Sodium Sulphite, U. S. P. Dosage: Applications of 1 in 10 or 1 dram to the ounce.

**Sodii Thiosulphas.**—Sodium Thiosulphate, U. S. P. Dosage: 1 gm. or 15 grains.

**Staphylococcus Vaccine.**—See Vaccine, Staphylococcus.

**Stramonium.**—Stramonium, U. S. P.

**Strophanthinum.**—Strophanthin, U. S. P. Dosage: 0.0003 gm. or 1/200 grain.

**Strophanthus.**—Strophanthus, U. S. P.

**Tinctura Strophanthi.**—Tincture of Strophanthus, U. S. P. Dosage: 0.5 c.c. or 8 minims.

**Strychnina.**—Strychnine, U. S. P. Dosage: 0.0005 to 0.005 or 1/100 to 1/10 grain.

**Strychninae Nitrates.**—Strychnine Nitrate, U. S. P. Dosage: 0.001 gm. or 1/60 grain.

**Strychninae Sulphas.**—Strychnine Sulphate, U. S. P. Dosage: 0.001 gm. or 1/60 grain.

**Sulphonal.**—See under Sulphonmethanum.

**Sulphonethylmethanum.**—Sulphonethylmethane, U. S. P. — Trional. Dosage: 1 gm. or 15 grains.

**Sulphonmethanum.**—Sulphonmethane, U. S. P.—Sulphonal. Dosage: 1 gm. or 15 grains.

**Sulphur.**—Sulphur.

**Sulphur Lotum.**—Washed Sulphur, U. S. P. Dosage: 4 gm. or 60 grains.

**Sulphur Praecipitatum.**—Precipitated Sulphur, U. S. P. Dosage: 4 gm. or 60 grains.

**Sulphur Sublimatum.**—Sublimed Sulphur, U. S. P. Dosage: 4 gm. or 60 grains.

**Unguentum Sulphuris.**—Sulphur Ointment, U. S. P.

**Tannalbin.**—See under Acidum Tannicum.

**Terebinthina.**—Turpentine, U. S. P.

**Oleum Terebinthinae.**—Oil of Turpentine, U. S. P. Dosage: 1 c.c. or 15 minims.

**Terpini Hydras.**—Terpin Hydrate, U. S. P. Dosage: 0.125 gm. or 2 grains.

**Tetanus Antitoxin.**—See Serum Antitetanicum.

**Theobromitas Oleum.**—Oil of Theobroma, U. S. P.

**Theobromina.**—Theobromine, N. N. R. Dosage: 0.3 gm. or 5 grains.

**Theobrominae Sodio-Salicylas.**—Theobromine Sodium Salicylate, N. N. R.—Diuretin. Dosage: 0.5 gm. or 7½ grains.

**Thymol.**—Thymol, U. S. P. Dosage: 0.1 gm. or 2 grains.

**Thymolis Iodidum.**—Thymol Iodide, U. S. P.

**Thyrordeum Siccum.**—Dried Thyroids, U. S. P. Dosage: 0.06 gm. or 1 grain.

**Typhoid Vaccine.**—See Vaccine, Typhoid.

**Tiglii Oleum.**—Croton Oil, U. S. P. Dosage: 0.05 c.c. or 1 minim.

**Tragacantha.**—Tragacanth, U. S. P.

**Trinitrophenol.**—Trinitrophenol, U. S. P. Dosage: 0.03 gm. or ½ grain.

**Trional.**—See under Sulphonethylmethanum.

**Tuberculinum.**—Tuberculin, N. N. R.

**Urotropin.**—See Hexamethylenamina.

**Vaccine, Staphylococcus.**—Staphylococcus Vaccine, N. N. R. (to be added). Dosage: 1,000,000,000 bacteria.

**Vaccine, Typhoid.**—Typhoid Vaccine, N. N. R. Dosage: 500,000,000 to 1,000,000,000 bacteria.

**Vaccine, Virus.**—See under **Virus, Vaccine.**

**Valeriana.**—Valerian, U. S. P.

**Tinctura Valerianae Ammoniata.**—Ammoniated Tincture of Valerian,  
U. S. P. Dosage: 2 c.c. or 30 minims.

**Veronal.**—N. N. R. Dosage: 0.3 to 0.6 gm. or 5 to 10 grains.

**Sodii Diaethyl-Barbituras.**—Sodium Diethyl-Barbiturate, N. N. R.  
Dosage: 0.3 to 0.6 gm. or 5 to 10 grains.

**Virus Vaccinum.**—Vaccine Virus, N. N. R.

**Zinci Acetas.**—Zinc Acetate, U. S. P. Dosage: 0.125 gm. or 2 grains.

**Zinci Chloridum.**—Zinc Chloride, U. S. P.

**Liquor Zinci Chloridi.**—Solution of Zinc Chloride, U. S. P.

**Zinci Oxidum.**—Zinc Oxide, U. S. P. Dosage: 0.25 gm. or 4 grains.

**Unguentum Zinci Oxidi.**—Ointment of Zinc Oxide.

**Zinci Stearas.**—Zinc Stearate, U. S. P.

**Zinci Sulphas.**—Zinc Sulphate, U. S. P. Dosage: 2 gm. or 30 grains.

**Zingiber.**—Ginger, U. S. P. Dosage: 1 gm. or 15 grains.

**Tinctura Zingiberis.**—Tincture of Ginger, U. S. P. Dosage: 2 c.c. or  
30 minims.

# SOME THERAPEUTIC PRINCIPLES

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## INDIVIDUAL TENDENCIES

Teachers of therapeutics emphasize the necessity of individualizing the patient but sometimes forget the importance of family tendencies. There is no more doubt that a person inherits family weakness and family strength or, if the phrase is preferred, family tendencies, than there is that he inherits the features and general physique of his parents and grandparents. These tendencies are often recognizable by the general appearance and physical findings, but if not, they can almost always be discovered by a careful investigation into the family history of the patient.

## THE FAMILY HISTORY

It should be the rule of the physician to inquire into the family history carefully with every new patient. Heredity and environment are the two factors most prominent in the production of physical and mental health. Environment may improve or mar heredity, but cannot change it. Heredity is therefore the most important factor in raising and developing an ideal race. The importance of good environment for the perpetuation of physical and mental health requires no discussion. But environment will not eliminate a hereditary tendency to disease or to mental or physical insufficiency. Neither will environment develop perfect mental and physical health when there is an inherited deficiency, although environment can markedly improve deficiency caused by injury or acquired by disease.

The environment of prospective fathers and mothers and their future children is being constantly improved by the public health advances now being made in all communities but, as has been stated, this will not prevent the ravages of inherited disease (syphilis, epilepsy, insanity, imbecility, physical weakness) any more than environment can produce twins, beauty, geniuses or permanent health. In fact,



improved environment is doing more for the defectives in all lines than for those of good heredity, who would survive a less improved environment.

### UNSCIENTIFIC PRESCRIBING

Lack of scientific therapeutic teaching causes some physicians to use secret proprietary preparations for various conditions, when, in most cases, the active ingredient of the preparation used is a drug which they have long used, but in a simpler and less expensive manner. The general practitioner who writes of his therapeutic successes should constantly bear in mind, first, the trend of troublesome conditions to recovery; second, that it is not always the last drug, preparation or treatment that benefited the patient, but that the previous treatment may really have caused the cure; third, that many a new drug or new preparation offered with the enthusiasm of the physician cures a patient by psychic effect, much as does a change of physicians or a change of environment in many cases.

### THERAPEUTICS MORE THAN MEDICINE

The scope of therapeutics and its relation to the practice of medicine are well shown by the accompanying chart prepared by Dr. Osborne. (*Amer. Jour. Med. Sci.*, 1916.)

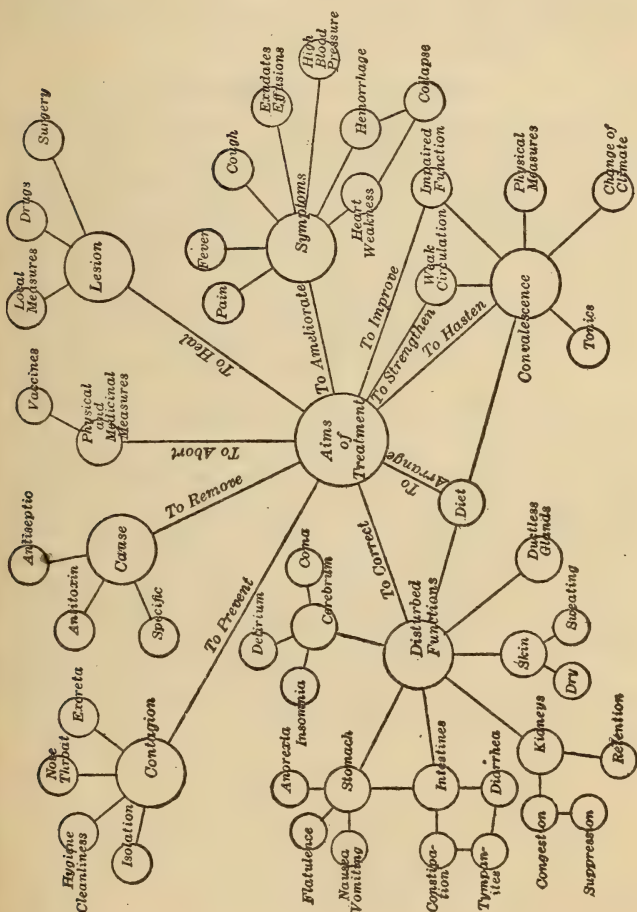
A disease cannot be correctly treated unless the following facts are considered:

1. Can the etiologic factor in a given disease be discovered, and can it be removed? This is the primary treatment.

2. What physiologic processes in this patient are disturbed by this disease? The aim of all treatment should be the attempt to correct such disturbed physiology, and at the same time not disturb the normal physiologic processes.

3. The pathologic conditions which are the result of the disease should be removed if possible, ameliorated if removal is not possible; and never irritated or made worse by any medicinal or physical treatment.

Special care should be taken that whatever treatment is deemed advisable for the patient, it should not aggravate or make worse the pathologic condition present.



4. The symptoms and signs of the disease which in their totality determine the diagnosis, and the extent to which the pathology of the disease has progressed, are in their totality of minor and secondary importance in

the treatment. On the other hand, individual troublesome symptoms must be removed or ameliorated, else normal physiologic processes which are necessary to recovery cannot be performed, and toxemias that otherwise need not have occurred may perhaps be the determining cause of the nonrecovery of the patient.

### PAIN AS A SYMPTOM

Of all symptoms, pain is most important; it is one from which the patient must have relief. It does not seem to make much difference whether such pain is pathologically excusable or present only on account of psychologic mistake, the nervous irritability and depression caused by it must be taken into consideration and must be treated or, better, managed. At least, pain must be prevented at any cost. This does not mean that the physician should hasten to the use of unneeded narcotics, nor that he should ever use a narcotic without regret and without the extra supervision that should always go with such treatment, but it is the skillful, thoughtful, discriminating physician who can determine the best method of eradicating the symptom of pain in each individual patient. It is frequently possible, in making examinations or in treating patients, to secure for them great comfort merely by altering the posture. Pain after operation is frequently due to lack of support of the back. Incidentally the soothing effects of the warm bath or the warm pack should not be overlooked. It is frequently possible by the use of such means to relieve pain without the employment of a narcotic.

# INFECTIOUS DISEASES

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## SCARLET FEVER

### PROPHYLAXIS OF SCARLET FEVER

“Scarlatina,” “scarlet rash” and “scarlet fever” are synonymous terms. While scarlet fever may be, and often is, a very serious disease, with high temperature, severe sore throat, intense and widely spread eruption, followed by copious desquamation, on the other hand the fever may be slight or entirely absent, the throat may not show more than slight congestion, the eruption, if not entirely absent, may be not very pronounced in appearance, not widely spread over the body and of rather transient duration, while the desquamation may be so slight as to be hardly recognizable.

It is now generally recognized not only that the very mild cases may be followed by the most serious sequelæ which are observed after the severe forms of the disease, and particularly by inflammation of the kidneys, but also that severe forms of scarlet fever may be, and often are, contracted from patients whose symptoms have been exceedingly mild.

A possible explanation of apparent immunity to scarlet fever may be, at least in some cases, that these immune individuals have in their earlier life passed through an attack of scarlet fever of so mild a type that a physician was not called to the patient, or if one was called, he did not recognize the nature of the disease. This, however, probably does not explain all cases of apparent immunity. Undoubtedly there are many persons who never contract the disease except after unusual exposure. On the other hand, it is unjustifiable carelessly or wittingly to expose a child or adult to the disease, no matter how mild the type may be.

### CONTAGIOUSNESS

It was long believed that the contagious element of the disease existed in the scales which occur in greater or less profusion during desquamation. At present

we believe that the scales in themselves do not possess the power of transmitting the disease. On the other hand, they may become contaminated by infected secretions; hence it is important to prevent the dissemination of these scales.

The belief has been gaining ground that the element of contagion exists actively and abundantly in the secretions from the throat and nose, and also in the discharges from the ear and from the suppurating glands, when they are present. Also it is believed that when the disease is transmitted by dissemination of the scales, it is due to the fact that the latter have been contaminated by these secretions. Obviously then, the problem which confronts both family and physician, as well as sanitarian, is to control the dissemination of these various secretions, discharges and exfoliations.

#### ISOLATION AND DISINFECTION

The mastery of the problem embraces first, isolation; second, disinfection.

The establishment of isolation often taxes severely the tact and good judgment of the physician. If the family is large and lives in a small house or apartment and on a limited income, and if the municipality possesses an isolation hospital, or wards of a hospital are set apart for the treatment of contagious diseases, the easiest way is to transport the patient immediately to such an institution. Here he will be under the care of attendants who are accustomed to handle patients with the disease, and who are trained to exercise all the precautions necessary to prevent the spread of the disease. Most towns have no special provision for taking care of scarlet fever, and in such cases the patients must be treated in their own homes. If the family has ample means and lives in a large house, a large room or a suite of rooms must be set apart for the exclusive use of the patient and the special attendant, who must be secured to give him exclusive attention. Such an apartment or suite should, if possible, be selected on the top floor of the house or at the end of a hall, so that the other members of the family will have no occasion to go near it. The room should



be large and sunny, and all unnecessary articles, such as curtains, upholstered furniture, and ornaments, should be removed, so that there will be as few articles as possible to which the disease poison may adhere and which will need to be cleaned or destroyed after the recovery of the patient. The attendant should not invade other parts of the house. Food and other necessities should be left outside the door of the apartment occupied by the patient by another member of the household. Similarly, everything which requires removal from the infected apartment should be disinfected and placed outside the apartment, and thence carried away. The most important things which are likely to require removal are dishes, clothing, and excreta. These should be disinfected by being placed in suitable vessels and then allowed to soak for an hour in a 2.5 per cent. solution of phenol (carbolic acid). Things which are of little or no value and which are combustible, such as the remnants of food and pieces of cloth or paper which have been used about the room, should be burned. If the nurse finds it necessary to leave the patient's quarters, she should change all her outer garments outside of the patient's room, she should cover her hair, and avoid coming into close contact with anyone. These precautions of isolation should be carried out continuously and strictly until desquamation is entirely completed.

During the period of desquamation the patient should be sponged or bathed once or twice a day with hot water (and if there are bathroom facilities the convalescent should have a daily hot tub bath), and then the skin should be anointed with *adepts lanæ hydrosus* (lanolin) which has been softened with almond (or other bland) oil, and perfumed to suit. Phenol (carbolic acid) ointments are inadvisable, as any absorption would irritate the kidneys. Sponging with alcohol is contra-indicated. After desquamation has ceased, the patient should remove all the clothing which he has been wearing, take a warm bath, with soap, and have his head well shampooed. Then he must dress throughout in fresh clothing.

## TERMINAL DISINFECTION

The apartment should be thoroughly disinfected.

Fumigation after scarlet fever, diphtheria and measles does not seem to pay for the cost and trouble it causes. Proper fumigation with strong formaldehyd, carried out by boards of health, should still be done for smallpox and tuberculosis, and perhaps for erysipelas, childbed fever and tetanus, especially in hospitals. Spraying with germicides of all the immediate surroundings of an infected patient is the method of disinfection now most satisfactory. All washable clothing and bedclothing should be boiled; all other clothing should be baked and put into the sunlight. Carpets and rugs may be thoroughly sunned and aired or washed with antiseptics. Various washing solutions may be used, such as chlorinated lime solutions, 5 per cent., formaldehyd solutions, corrosive sublimate solutions 1:500, 5 per cent. phenol (carbolic acid) solutions, or better, the higher coal-tar disinfectants, as liquor cresolis compositus. The New York Board of Health orders the woodwork and floors scrubbed with hot solution of 1 pound of washing soda to 3 gallons of hot water. Bedding and night clothing are ordered soaked in phenol solutions and then boiled in soapsuds for half an hour. Books and toys should be burned. It should never be forgotten that outside air and sunlight are among the most useful of disinfectants.

## ISOLATION OF PATIENT

When it is possible to carry out such strict isolation as has been described, there is no necessity of quarantining the rest of the family but, unfortunately, such complete isolation is ideal and can rarely be carried out in actual practice. Even when a large family occupies a few rooms, it is essential that one room be selected for the patient, and that he be kept in it constantly, and that the other members of the family be kept out of it entirely, except that one who is selected to act as the attendant, usually the mother. Under such conditions it is usually entirely impracticable for the attendant to remain constantly in the room with the patient. She must frequently leave the room, not only

to get things which the patient requires, but also to perform services for the remainder of the family. Under these circumstances it is desirable and often entirely practicable that such members of the family as attend school, or work in stores or shops, should leave home, and live elsewhere for six or eight weeks. Those who are obliged to remain at home should avoid as much as possible coming in contact with the attendant. The latter should have several aprons, with sleeves, and large enough to cover all her outer clothing. One of these she should wear constantly while in the patient's room. Needless to state, she should always wash her hands on leaving the room.

#### PROPHYLACTIC MEASURES OF PHYSICIANS

It is generally believed by the medical profession that physicians who use even a moderate degree of caution rarely transport the disease from a patient to another individual, and when this does happen, the victim is usually a member of his own family. He should endeavor to so arrange his calls that he will not go directly from a patient ill with scarlet fever to a family in which there is a child. On entering the room of such a patient he should put on a long cotton, linen or rubber coat. He should avoid sitting on the bed, or allowing the bedclothing to come in contact with his own clothing. On leaving the room he should thoroughly wash his hands and dry them on a clean towel and remove the gown just outside the patient's door.

#### PROPHYLAXIS DURING CONVALESCENCE

During convalescence the patient should not be allowed to use books from the public library or the public school, and should use only such books, magazines and newspapers as can be burned when he is through with them, or when the period of isolation is ended. Neither should he be allowed to write and send letters through the mail or by messenger to his friends.

No drug treatment is known that will prevent persons exposed to the disease from contracting it or developing it. Although belladonna has been exten-

sively used for this purpose, there is no reason for believing that it has ever produced this result.

Although often advocated, and sometimes used, the impregnation of the atmosphere of the room with antiseptics (phenol) and aromatic oils seems to be of no value in killing the germs or in hastening recovery. Various cresol preparations and oil of eucalyptus have been especially recommended for this purpose, but their value is small, and the danger of too much absorption of phenol vapor causing kidney irritation is ever present.

Dogs and cats must be excluded from all patients suffering with contagious diseases, and this is especially true of scarlet fever. The doors and windows must be screened from flies, if it is the season for them.

#### VACCINES IN PROPHYLAXIS

The use of vaccines of streptococci and other organisms found in the throat during scarlet fever has been suggested as desirable in prophylaxis. The use of extracts of the scales and of convalescent serum has also been suggested. The available evidence seems to indicate that convalescent serum may have virtue both in prophylaxis and treatment. There is as yet no good reliable evidence to justify the use of the other measures mentioned.

#### TREATMENT

*A. Isolation.*—Strict isolation measures, already discussed under other headings, are most important in this disease, and the nurse should distinctly understand that it is the secretions of the mouth and nose, and perhaps suppurating complications, that carry infection. The greatest possible care to disinfect or sterilize articles contaminated by such secretions should be exercised, as the infecting germ is persistent and lives for a long time unless killed. The most efficient cleanliness of the patient, nurse, and the physician who handles the case is also essential.

*B. Diet.*—As in the beginning of all diseases, especially the infectious diseases, the bowels should be thoroughly evacuated with castor-oil, calomel, or whatever the physician deems best; subsequently, they

should be moved daily by some gentle laxative. If the patient has diarrhea, it is generally caused by a mistake in the diet. Milk is the best basis for the diet in scarlet fever. Intestinal indigestion is not frequent. Foods that add products to the blood that during excretion are likely to cause irritation of inflamed kidneys should be avoided. The aim of the physician should be to diminish the inflammation and irritation of the skin, to keep it warm, to attempt to keep it moist and promote its secretion, and to give a diet rather low in proteins and without meat, meat extractions or purins. Also, if possible, no drugs should be administered that tend to irritate the kidneys, especially after the first week of the illness. Such drugs are coal-tar products, synthetic products, caffeins, and any of the drugs that are known as stimulant diuretics. Even drugs that contain salicylic acid should be avoided.

The greater the intensity of the disease, the more liquid the diet should be. While milk is the basis, thin cereal gruels are advisable from the start. Malted milk may be added to this diet, and lemonade or orangeade or oranges, as deemed advisable. Later, toasted bread, crackers, and various kinds of cereals, and still later, baked potato, rice, corn starch, and many other cereal and milk foods, as well as a greater variety of fruit, should constitute the diet.

As soon as the convalescence is established, and even before, if the disease is prolonged, a small dose of iron should be given daily, as on the above diet the blood cannot get this nutriment. A sugar of iron (saccharated oxid of iron) 3-grain tablet should be given from one to three times a day. Sodium chlorid should always be given a patient from the beginning, once or twice a day, in one or more of the feedings. If there is a tendency of the nose and throat to bleed, or there are hemorrhages in any other part of the body, lime-water should be added to the diet. The patient should always receive plenty of water. If any apparent irritation of the kidneys occurs, it may be well to withhold the fruits and to temporarily diminish the amount of food.



*C. Fever.*—If the temperature becomes very high it may be advisable to give several doses of an antipyretic, such as acetanilid, antipyrin, or acetphenetidin, always bearing in mind the irritant effect of these drugs on the kidneys. Warm sponging of the body will also tend to reduce the temperature and make the patient comfortable. It relieves itching, and many times is soothing. Cold sponging in scarlet fever is inadvisable. If the fever is excessive, tepid sponging may be tried. Restlessness and sleeplessness will also increase the fever, and often a few doses of sodium bromid will be of great benefit. It not only causes the patient to sleep, but reduces the irritability of the peripheral nerves. Also, anything that relieves itching or burning of the skin will reduce the temperature and the irritability. Quinin is inadvisable, as it is excitant to the brain and may tend to congest the ears and add one more element that may cause middle-ear complications. An ice cap to the head, unless actual meningitis is present and the hair is clipped close to the scalp, is inadvisable. Whether ice caps to the head ever reduce general temperature is open to grave doubt. If there is meningitis, they may relieve the local congestion. Ice caps, however, tend to fall to one side or the other of the head and unnecessarily chill the ears, and may become another factor in causing middle-ear inflammation. The value of an ice bag over the mastoid when it is in danger is not under discussion; but an ice cap over an external ear is not called for, and may do harm.

*D. Care of the Nose.*—Antiseptic, alkaline and cleansing gargles and sprays for the throat should be freely used. The cleaner the nose and throat in scarlet fever, the less the secondary infection, the less the toxemia, and the less the danger. Whatever method is used to clean the nostrils, such pressure of the liquid as would tend to force infection into one or the other of the sinuses must never occur. If there is no purulent discharge from the nostrils, it is inadvisable to spray or douche them, as much harm can be done from too strenuous or unnecessary treatment of the nose.

*E. Skin.*—Whatever the temperature, hot sponging for cleanliness once or twice a day is soothing and

advisable. Sponging with alcohol in any form is inadvisable. Alcohol, unless the solution is so dilute as to represent not alcohol but only an alcoholic odor, will tend to dry the skin, cause more itching, and more discomfort. Sponging with bicarbonate of soda in warm water soothes the irritability and stops the itching. Powdering with some soothing talcum powder also stops itching and quiets the patient.

As soon as the acute eruption is over and desquamation is about to begin, gentle rubbing into the skin of some bland oil, as cocoanut oil or almond oil or wool-fat, sometimes with a little glycerin and water, hastens the removal of the dried epithelium, prevents the scales from flying about (although these scales do not carry the contagium) and is very quieting to the patient, by preventing the irritation and itching. As soon as convalescence is established, a more active massage of the skin and muscles is advisable.

The use of mercuric chlorid or phenol solutions of any strength, or phenol ointments, on the skin, is inadvisable. Most of these solutions tend to dry the skin still more; and the use of phenol ointment might result in some absorption and therefore is of danger to the kidneys. Also, as it seems to be a fact that contagium is not spread by the skin, there is no excuse for germicidal ointments or applications.

Unless the temperature is very high and head symptoms are present, it is unnecessary to cut the hair close to the scalp. If the scalp itches, as it often does, a little petrolatum may be rubbed into it and will give relief. A tar soap may stop the itching. Oil of eucalyptus has been recommended and used as a non-irritant application to the skin and scalp. Also, throats have been swabbed with oil of eucalyptus preparations, in the belief that eucalyptus oil is especially antiseptic in throat contagions.

*F. The Heart.*—Cardiac stimulation, especially in children, is rarely needed in this disease. The toxin of scarlet fever is not as depressant as is that of diphtheria, and strychnin is generally inadvisable as it causes too much cerebral stimulation, especially in children.

If a long septic process follows scarlet fever, or there is later a septicemia, small doses of strychnin may be of value, and alcohol is of value as not only adding a food, but as tending to prevent a dangerous acidemia. Also, in such septic conditions, as much carbohydrates should be given as the patient can digest.

If joint complications occur, there is likely to be an endocarditis, and perhaps chorea may develop.

*G. Late Complications.*—*Middle-ear inflammations* should be expected and watched for. The drums should be early punctured if there is pressure, and the services of an expert on diseases of the nose, throat and ears should be early sought by the physician, if such complications occur.

The *glands* of the neck are almost always congested and enlarged in scarlet fever, and one or more may tend to suppurate. It often seems that the local application of a proper-sized ice-bag to a gland, if the patient will tolerate such an application, aborts serious inflammation. However, if such a suspicious gland continues to enlarge, the temperature rises and blood counts show an increasing leukocytosis, there is probably pus formation, and the abscess should be soon opened. The surgeon, however, often decides that he prefers to have warm applications for a short time to cause more rapid breaking down of the central suppurating portion of the gland, so that more complete evacuation may occur on incision. The subsequent dressings and treatment of such an abscess are purely surgical. The temperature will generally drop after the evacuation of the pus, unless there is some other localized septic process.

Although the percentage of occurrence of *nephritis* in or following scarlet fever is not great, it occurs sufficiently often to be always looked for and expected. As above urged, all drugs that irritate the kidneys and all foods that cause irritation should be withheld. While it has not been shown that meat will cause nephritis, it is not necessary to add meat to the diet in scarlet fever. Many believe that eggs should not be allowed. The withholding of eggs as a preventive of nephritis hardly seems necessary. Some physicians even withhold salt from the food; this does not seem

necessary. In giving fluids, patients may be encouraged to take larger quantities by supplementing water with citrate solutions or lemonade. This not only aids diuresis but may also be of value in reducing acidosis. If the amount of urine greatly diminishes and albumin appears, there may not be an actual nephritis, but it may be well to attempt to forestall or abort such an inflammation. Hot packs or applications to the lumbar region can do nothing but good. Perhaps the best preventive of nephritis is prolonged rest in bed for at least a week after the fever has ceased, as it seems to be a fact that the better the action of the skin, the less likely are the kidneys to become inflamed, and the skin will be warmer, and is likely to be more moist in bed than when the patient is about. Chilling of the body following scarlet fever is an important added cause for the development of nephritis. Also, if the kidneys have been sufficiently irritated to cause a distinct predisposition to nephritis, an increased use of the muscles, whether by playing, exercise, or work, too soon after the acute symptoms are over, may so increase the excretory substances from muscle metabolism as to add a very tangible factor to further irritation of the kidneys and consequent nephritis. If nephritis develops, the treatment should be as described under that heading.

*H. Convalescence.*—As just suggested, the patient should remain in bed one week after the fever has ceased, and the subsequent convalescence should be prolonged and carefully watched. During the acute stage of the disease the urine should be examined daily, to note the first appearance of albumin and how long it persists. During the convalescence the urine should be examined at least every other day for two weeks, and once or twice a week for several weeks more. The diet should be increased and most foods allowed, except that it may be well for at least two weeks not to give meat. During this period the patient should continue to receive iron. If the weather is cold and damp, great care must be taken that the patient be not exposed.

Just how long the germ of infection persists in the mouth, and especially in the nose, has not been determined, but secondary cases can occur when the patient,



especially if he has a nasal discharge, has been allowed to play with other susceptible children. It was long thought that the desquamating skin was the cause of this late infection of others.

*I. Use of Vaccines.*—As it is conceded that streptococcic infection is concomitant with the cause of many of the complications of scarlet fever, vaccine treatment with stock vaccines or autogenous vaccines has been suggested and advised to hasten the eradication of left-over septic processes. The same rules and regulations, and the same frequency of success will doubtless occur in the septic processes following scarlet fever as with any other septic process.

*Convalescent Serum.*—The most recent and certainly a scientific treatment for scarlet fever is the injection of convalescent blood or serum. Reiss and Hertz (*München. med. Wchnschr.*, Aug. 31, 1915) used the mixed serum from several scarlet fever convalescents. They injected it intravenously in large doses, 50 c.c. for children and 100 c.c. for adults. The results, they believe, were lifesaving in many instances. The injections were commenced on the fourth or fifth day, and continued as long as needed. The serum was taken from donors in the eighteenth to twenty-fourth day of convalescence, after negative Wassermann tests and the exclusion of tuberculosis and sepsis.

Zingher employed convalescent whole blood, aspirating it from the cephalic vein of the donor, citrating it by adding the blood to a 10 per cent solution of sodium citrate in the proportion of 1 ounce of blood to each cubic centimeter of the citrate solution. The needle is not removed from the donor's vein until sufficient blood (from 4 to 10 ounces) has been secured. It is then injected into the patient, best intramuscularly, using the triceps, outer regions of the thighs, the calves and gluteal regions. In young children one-half ounce, in older children and adults one ounce is injected in each place. The injections may be repeated at intervals of four to five days. In early toxic or malignant cases he found frequently a critical drop in temperature, a disappearance of delirium, fading of the rash, improvement of circulation and general



improvement occurring rapidly after the injection of the convalescent blood. In later septic cases he found the injection of the whole blood from normal cases to have nutritive and stimulating properties. In septic cases, when the prognosis is doubtful or poor, the treatment should invariably include the administration of this harmless yet frequently efficient remedy.

## MEASLES

### THE PROPHYLAXIS OF MEASLES

Measles is a disease to which practically every person who has not already suffered an attack is susceptible. It is one of the most contagious of diseases. This was particularly evident in the large epidemics of measles attacking our troops during the mobilization on the Mexican border and those which occurred in the cantonments.

It seems almost invariably true that one attack of the disease is protective, though a second, third, and even fourth attack sometimes occurs. It is probable that many of these so-called repeated attacks are some other disease, as German measles, or eruptions due to food poisoning.

It has been observed that children under six months of age are less likely to take this disease than older children, and that extremely old people are also less susceptible. It seems to be a fact that the disease is most disastrous in its effects on infants, on persons who are tuberculous or who have any tendency to tuberculosis, on those who are debilitated from any cause, and on women who are pregnant or who have recently been confined.

Efforts should be made, therefore, to isolate children who are suffering from measles in order to prevent the spread of the disease.

The contagious material of measles appears to have less vitality and to resist the ordinary measures of disinfection, including sunlight and fresh air, much less strongly than does the contagium of scarlet fever. It seems to exist in the secretions from the nose, throat and mouth, and the disease seems to be

especially contagious during the period when the catarrhal symptoms are manifest but before the cutaneous eruption appears. This increases the difficulty of enforcing efficient quarantine. When the disease is prevalent, children who show symptoms of cold in the head should be suspected of having measles and carefully watched, but at the beginning of an epidemic it is rare that a child will be placed in quarantine before the eruption has appeared. The Koplik spots appear in the mouth within three days before the catarrhal symptoms develop. Their appearance should be indication for immediate quarantine.

The measures applicable to cases of measles may be briefly summarized as follows:

The isolation of the patient in a remote room of the house.

The selection of a single immune person to care for the patient.

The wearing by the physician of a linen or rubber coat when he visits the patient, which is removed outside of the patient's door.

The destruction of books and toys which have been used by the patient, at the end of the period of quarantine.

The disinfection of dishes and clothing before they are removed from the sickroom.

At the end of the period of quarantine, which in the case of measles unattended by complications should be three weeks, the bathing and shampooing of the patient and dressing him in fresh clothes.

The disinfection of the room, after it has been vacated, by exposure of the room so far as possible to fresh air and sunshine.

Sunshine and light are essential to the killing of the germs of all disease, and especially of measles; hence the room of a patient suffering from measles *should only rarely be kept dark during the day*. The patient's eyes may be efficiently protected from light by blue or smoked glasses.

It has been suggested that children may be protected against measles by the injection of from 7 to 25 c.c.

of the serum of convalescent patients, but there is as yet not sufficient evidence for the routine use of this procedure.

The prolonged cough of measles after the period of quarantine is over should be treated as though the patient had incipient tuberculosis, and the number of secondary deaths from measles will be cut in half.

The secondary respiratory infections of measles are so serious that it may be considered advisable for both patient and attendants to wear gauze face masks as soon as convalescence begins. Droplet infection is thus inhibited.

### TREATMENT

A patient with measles must be isolated. The room must be warm, as these patients should not be subjected to cold drafts or cold air. Chilling is especially harmful in measles, because of the frequency of lung complications. This does not mean that the air of the room should not be fresh and clean, and the ventilation the best possible.

*Eyes.*—Unless the child is very young and cannot wear colored spectacles, the room should not be dark. Sunlight is as essential for the welfare of patients with measles as it is in any other disease. It is absolutely unnecessary, in ordinary cases, to have the room black dark on account of the eyes. If the eyes are inflamed, the child will cooperate and really enjoy using colored spectacles. Of course, when it is time for the child to go to sleep, the room may be darkened, and the glasses removed.

A saturated boric acid solution may be used as a wash for the eyes, and if it seems advisable, some simple eye-drops may be used, such as:

	Gm. or C.c.	
R. Acidi borici.....	25	gr. v
Aquae camphorae.....	15	flʒ ivss
Aquae .....q. s. ad.	25	flʒ i

M. Sig.: Use as eye-drops three or four times a day.

If the lids tend to stick together after sleeping, they should be gently washed with warm boric acid solution or plain warm water, and before the child

goes to sleep the edges of the lids may be anointed with thick white petrolatum.

*Cough, etc.*—If old enough, the child should gargle several times a day with some simple, warm, alkaline sedative solution. If the child is not old enough to gargle, the throat should be sprayed. The nose should also be sprayed occasionally, if it seems to be occluded by the secretions. It is often well to leave the nose alone in measles. Most nasal douching is inadvisable, as tending to force fluid or secretions into the eustachian tubes.

Most of these patients require some simple expectorant mixture, although many physicians are losing faith in the activity of so-called expectorant drugs. There is no safe drug that promotes the secretion of the mucous membrane of the upper air passages and bronchial tubes more than does ammonium chlorid. It is of advantage in causing the cough to be less dry, and therefore aiding the expulsion of any mucopurulent matter that may be in the trachea and bronchial tubes. If the cough is excessive from irritation, a sedative may be added to prevent the unnecessary coughing. A child 5 years old may receive:

	Gm. or C.c.	
R Codeinae sulphatis .....	05	gr. i
Ammonii chloridi.....	3	3 i
Syrupi tolutani.....	50	fl 3 ii
Aquae .....q. s. ad	100	fl 3 iv

M. Sig.: A teaspoonful, in water, every two or three hours, when the child is awake.

If the child's cough is not excessive or irritating, the codein may be omitted from the mixture. As soon as the expectoration is more free and there is no excessive amount of coughing, the medicine may be stopped. A child 10 years old should receive twice the amount of codein sulphate, and the ammonium chlorid should be increased to 5 gm., and if deemed advisable, the sour sirup of citric acid may be substituted for the sweet sirup of tolu in amount of 25 c.c. to the 100 c.c. mixture.

Because of the frequency of bronchopneumonia following measles all lung symptoms should be carefully watched.

*Bowels.*—In the beginning of the disease, the child should receive a dose of castor oil, or some cascara; the bowels should be thoroughly and well moved. Minute doses of calomel frequently repeated should not be given, as such dosage causes irritation, and medication may cause an enteritis, a not infrequent complication of measles. Subsequently the bowels may be moved daily with some gentle laxative if needed.

*Diet.*—The food depends on the temperature and should be milk and cereal gruels as long as the temperature is elevated. As soon as the temperature falls to normal, the child should receive good nutritious food, and plenty of it. It is inadvisable to give meat in any form, including broths, as long as the eruption is present. If, as has been suggested, the eruption in measles is caused by some irritant circulating in the blood, such as occurs in urticaria, representing a sort of anaphylaxis, the proper diet comprises cereals, milk, and plenty of water.

*Fever.*—The temperature rarely calls for much treatment. If it is high, however, one or two doses of acetanilid will generally be sufficient to reduce it. Warm sponging will cool the child as much as cold sponging will, and with less disturbance. Cold sponging in measles is inadvisable. As often as the child is bathed or sponged for temperature, the surface of the body should be powdered with some bland talcum.

*Skin.*—Unless the room is cold and damp, or the patient is otherwise ill, a cotton nightdress will cause less itching and discomfort than would a warmer flannel or silk shirt. All through the illness the nurse should recognize that it is the secretions of the nose and throat that cause infection of others, and not the eruption or exfoliation from the skin. This does not mean that it is not necessary to sterilize the child's garments and bedclothing, as such may carry the infection from the nose and throat.

*Convalescence.*—Prolonged, careful convalescence is essential in measles. Measles, like whooping cough, is often a forerunner of pulmonary tuberculosis, or more acute lung complications. Probably every attack of measles causes enlargement and more or less



inflammation of the bronchial glands. If such glands harbor tubercle bacilli, they are stimulated to cause an acute infection. On the other hand, immediately after an attack of measles a patient is doubtless more susceptible to infection from tubercle bacilli. Therefore, before the child is returned to school the cough should have ceased, his weight should be normal, and his nutrition should be good.

Persistent enlarged glands in the neck or elsewhere, and adenoid conditions or enlarged tonsils, should all be regarded with suspicion. Such conditions are liable to be accentuated by an attack of measles, and proper treatment should be instituted. A suppurating ear must be treated by a specialist until it is pronounced cured and the hearing is as near perfect as possible. The physician should remember that most defective ears follow measles, scarlet fever and influenza; that an acutely infected ear, if immediately correctly treated, is generally saved intact; distention and perforation may occur without pain. Consequently, he should be ever alert to see that the complication of middle-ear inflammation is immediately treated.

## WHOOPIING COUGH

### THE PROPHYLAXIS OF WHOOPING COUGH

The great mortality of whooping cough is indirect. A large number of those infected die of such complications as bronchial pneumonia, capillary bronchitis, tuberculosis and a few from hemorrhages, while chronic debility, anemia, emphysema, and some lesion of the central nervous system are of not infrequent occurrence. In young children and infants, whooping cough causes more deaths than measles, and some statistics show twice as many deaths as measles; 95 per cent. of deaths from whooping cough occur during the first five years of life, and the majority of these during the first two years.

It is pretty well proved that the Bordet-Gengou bacillus is the cause of this disease. It seems to be established that the greatest infectivity occurs during the initial stages of whooping cough, and that even

during the active paroxysmal stage there is less liability of infection of others, and in the later stages the causative germ is absent.

The Bordet-Gengou bacillus is a minute bacillus, occurring in large numbers among the cilia of the epithelial cells of the mucous membrane of the trachea and bronchi. It is stated that the germ does not grow above the larynx, although of course by coughing it reaches these parts.

This disease occurs largely in epidemics, and young children and babies are apparently most susceptible to infection. This may be more apparent than real from two reasons: first, because young children, necessarily remaining more in the house, are liable more frequently to come in contact with concentrated infected matter if an infected person comes near them; and, second, because a large number of older children and the majority of adults have probably had the infection and have become immune. However, when an adult or elderly person acquires the disease it is almost invariably severe. The muscular strength of adults makes the paroxysmal coughing of much greater danger; they are more liable to emphysema, heart strain and hemorrhage. They are not so liable to have pneumonic complications. Whooping cough, however, even in adult life, is a not infrequent stimulator of a latent tuberculosis. Often an adult, who is in close contact with a whooping cough patient, and who may have had the disease in childhood, develops a mild form of the disease; at least he has the catarrhal symptoms and coughs, more or less spasmodically. Whether the Bordet-Gengou bacillus is present in these cases has not been determined. It is a fact, however, that ordinarily one attack of the disease renders a person immune.

The incubation period of pertussis is not definitely known, and may vary from two to ten days; therefore before it is considered safe for a child exposed to this infection to return to school or to play with other children, at least ten days must have elapsed, and perhaps a better working rule is two weeks.

Pathologically, the disease manifests itself by a catarrh of the upper bronchial tubes, trachea, larynx and perhaps pharynx and nose. The secretion is

mostly mucus, with perhaps, later, a mucopurulent discharge from secondary infection. A severe paroxysm of coughing, or a prolongation of paroxysms, may cause hemorrhages; perhaps more or less emphysema; always cardiac strain, and perhaps cardiac dilatation; and frequent paroxysms, anemia and emaciation. Hemorrhages may occur from the nose, in the eyes, or even in the brain.

The cough is laryngeal in type, is at first dry, and later becomes spasmodic and paroxysmal, thus differing from that of ordinary colds; that is, the coughs occur in series, more or less periodically, or in showers. With these paroxysms there is more or less closing of the larynx, with the attempt at inspiration through a narrowed glottis, which causes the characteristic whoop. These paroxysms increase in frequency as the disease progresses, and are precipitated by any change in the atmosphere and by suddenly breathing in cold air, as by laughing, and even by swallowing food, and they sometimes occur without any apparent cause, because of irritation from the germ and its consequences. The number of paroxysms in twenty-four hours varies, but there may be as many as fifty. Early in the disease there may be a slight fever.

#### TREATMENT

Unless the patient has considerable rise of temperature, it may not be necessary to put him to bed, but, especially with children, the paroxysms are generally diminished if the child is kept in bed for a time, or at least kept quiet. The more active the child, the more paroxysms. Consequently, even without fever, if a child vomits almost every meal, or if he coughs so severely as to cause hemorrhage, or shows that the right side of the heart is becoming strained (which is the side of the heart most affected), he must be put to bed and remain there.

The actual treatment of this disease may be divided into four heads: (1) to prevent the infection of others; (2) to shorten the disease, if possible; (3) to diminish the severity of the paroxysms; (4) to treat complications as they occur.

The first indication has already been considered.

The second indication is met by general hygiene and by drugs. Fresh air and sunshine, without exposure, are among the greatest mitigators of this disease. If the weather is pleasant, the child should be outdoors or on a veranda most of the time. If the weather is such that it is impossible to remain outdoors, he should be isolated in one, or better, in two large rooms, so that while one room is being thoroughly aired and cleansed he may go to the other one. There seems to be no question that the more infected or polluted the atmosphere of a room, the more the child will cough.

*The Diet.*—If the child vomits a meal as soon as he has eaten it, during a paroxysm, in a few minutes he should be given food again, with the probability that the next paroxysm will not so quickly occur but that the food may remain in the stomach and be digested. A child that receives insufficient nourishment from any reason should be given food more frequently. The character of the food should depend on his condition, and should be that which is found to be less frequently vomited. The best diet is cereal and vegetable, with milk and eggs. The end-products of meat metabolism are likely to raise the excitability and irritability of any one whose nervous system is irritated. For this reason meat should not be given, and no tea or coffee. A patient who is not allowed meat should receive a small dose of iron once or twice a day. Calcium in any simple form may be used as a nervous sedative and a nutrient. Hot baths before going to bed relax the nervous system and quiet the patient. Also massage is sometimes soothing. Of course, it is always essential to have the bowels move daily. Plenty of water should be given the child, as the more moist the mucous membranes, the less they are irritated, and the less frequent the paroxysms. For this object many inhalants have been devised. Perhaps the most important element of these inhalants, whether sprays or steam, is the water that they contain. Sometimes bland petroleum oils atomized and inhaled soothe the irritated mucous membranes.

Various antiseptics have been suggested. Antipyrin as a spray and gargle has been much used as a germicide in from 5 to 10 per cent. strength, and has been



much lauded in this disease. Quinin sprays, though more disagreeable, have been used in the throat as germicides. Various combinations with thymol and eucalyptol, and other mild aromatic antiseptics, have been used as sprays and gargles or inhalants. It is quite probable that a creosote or other antiseptic inhalant may inhibit the growth of germs in the trachea and upper large bronchi, provided the patient is old enough to cooperate and inhale the vapor into the lungs to that depth. As an application in the pharynx and mouth, hydrogen peroxid solutions, 1:5, would be as efficient as anything that could be offered. Many times, however, these "antiseptic" inhalants or atomizing substances cause irritation and paroxysms, and must be abolished, while mild alkaline solutions, well represented by  $\frac{1}{4}$  teaspoonful of sodium chlorid and  $\frac{1}{4}$  teaspoonful of sodium bicarbonate in a glass of warm water, cleanse and soothe the throat without causing paroxysms.

There are still many who believe that quinin given internally will shorten the disease. It has not yet been shown that quinin inhibits the growth of the Bordet-Gengou bacillus. If there is any tendency to secondary infection in the nasopharynx, with congestion of the ears, of course quinin should not be given.

The vaccine treatment aims to shorten the disease, but the exact value of vaccine in this disease has not been demonstrated. Thousands of cases have been vaccinated, and yet there is considerable doubt as to whether the vaccines are of much benefit.

Immunizing doses, to prevent the development of the disease in other children of the family, have been given in doses of 20 million bacilli, and the dose repeated four or more times, and the disease has been apparently prevented by such vaccination. Hess, who made a careful study of the vaccine treatment of whooping cough, was disappointed in this treatment of the disease; but he did find that in a certain percentage of cases immunizing doses prevented the development of the disease.

The third indication, namely, to diminish the severity of the paroxysms, is of great importance. It has already been stated that the more quiet the child, the



less frequent will be the paroxysms. Also, if the child lies down as soon as he begins to cough, he is less likely to vomit. An elastic abdominal belt seems to be of value in controlling the vomiting and the paroxysms of young infants especially. In some patients the paroxysms are so severe that chloroform inhalations have been given to prevent the intensity of the spasms. It has been stated that inhalations of chloroform actually lengthen the time between the paroxysms and shorten the disease. Chloroform inhalations may act as a germicide. On the other hand, the frequent administration of chloroform, even in small doses, is known to injure both heart and kidneys.

The most effective of all medicinal treatments is antipyrin and digitalis. A very good rule for the dosage of antipyrin is 0.05 gm. (about 1 grain) for every year of the child's age. This should be given three or four times a day, depending on the frequency of the paroxysms. It should not be continued indefinitely nor used to excess. Of course this rule is not applicable for higher ages. The frequency should be diminished as the frequency of the paroxysms diminishes. Coincident with the antipyrin should be given digitalis in the form of the tincture, and in the dose proper for the child's age, and determined by its effect on the child's heart and pulse. The heart needs help, both from the strain of the disease and also as antipyrin might cause some weakening of the heart. The antipyrin acts by causing less irritability of the nervous system and relaxing muscle spasm. Even though the drug has disadvantages, its disadvantages are much less than the harm caused by the whooping cough paroxysms.

The bromids have been frequently given in large doses. They act by inhibiting the reflex activity of the nervous system and by more or less dulling the peripheral nerves in the throat and upper air passages. Chloral has been used in order to depress the nervous irritability. Atropin or belladonna have been given in large doses; their value is due to the dulling of the peripheral nerves in the irritated part of the body. However, atropin is a stimulant, and cannot have much good effect in this disease, unless the dose is very large,

and with such large doses atropin intoxication readily occurs, that is, the pulse becomes rapid, the throat dry, the face flushed, and there is likely to be cerebral excitation and perhaps dilated pupils.

Antipyrin is best given, to a child, in solution, as follows:

	Gm. or C.c.	
R Antipyrinae .....	5	3 iss
Aquae menthae piperitae...	100	fl 3 iv

M. et Sig.: A teaspoonful, in water, three or four times a day.

This dosage is for a child 5 years old. Antipyrin is also available in the form of sweet flavored soft tablets which children will take readily.

Various hydrotherapeutic measures are often of value, and the hot bath is always useful in quieting the patient and relieving internal congestions.

The fourth indication, namely, to treat complications as they occur, is almost supererogation, as each complication calls for its proper treatment. However, under this heading the prevention of such complications may be urged. Vomiting may be prevented by quiet, rest for a while after eating, by the abdominal belt and by proper food. Nutrition must be kept up at any cost, and, if necessary, the child be given simple liquid nourishment every three hours. Not infrequently cod-liver oil is well borne and is an oil-nutrient of great value. Anemia must be prevented by iron. If it is seen that the heart is becoming strained, and the face and throat remain congested even after the paroxysm is over, showing that the right ventricle is in trouble, digitalis should be given and such rest as would be given any damaged heart. This treatment also tends to prevent hemorrhages. Even if the child is weak and the circulation is weak, strychnin is inadvisable, as it stimulates the nervous system and causes or allows more paroxysms to occur.

If the child has a history of enlarged glands or recurrent colds, or has inherited a tendency to tuberculosis, or tuberculosis has been present in the child's family, its convalescence after whooping cough should be prolonged, and country or seashore air should be urged where possible. Certainly, such a child should

not be confined in school until its nutrition has become as good as before the infection with whooping cough occurred.

### DIPHTHERIA

This throat inflammation has been known for centuries, having first appeared in the East and later in Europe, occurring mostly in epidemics. A carrier of this disease may communicate it to persons widely separated. While nearly all mankind is susceptible to smallpox, and a large majority to scarlet fever, many persons seem naturally immune to diphtheria. A closer contact is apparently needed with an infected person than in these other diseases.

This disease has always had a large percentage of deaths; but the death rate since the introduction of antitoxin has been constantly on the decrease, and with a better understanding of the proper dosage of antitoxin, and with the effort made to diagnose the disease early, the death rate will be more rapidly decreased. Our best sanitarians believe that for every case of diphtheria recognized, at least one sore throat that carries the Klebs-Loeffler bacillus escapes; in other words, there is an equal number of missed mild cases.

It has been shown that the normal hydrochloric acid in the stomach inhibits or kills the diphtheria bacilli; therefore it is exceedingly rare to find these germs in the intestines, and very rare to find diphtheritic membrane in the stomach.

In the majority of cases the tonsils, one or both, are the parts affected in diphtheria, and with the present methods of treatment, in a large portion of these cases the membrane will be limited to these regions. The soft palate is next most frequently attacked, the pharynx next, and nasal diphtheria, with proper care taken, is not very frequent. Laryngeal diphtheria is not a frequent complication of tonsillar diphtheria; when it occurs it generally begins as the original point of attack.

### CARRIERS

Diphtheria carriers may be convalescents, or those who have had contact with diphtheritic patients. The latter group may or may not later develop the dis-

ease. The term may be perhaps more properly limited to those who carry the germ for months. Diphtheria germs may live a long time on books or other substances, handled, coughed, sneezed on or expectorated on by a diphtheria patient, and may infect persons coming in close contact with such infected material. This method of infection may not be very frequent. Animals may carry the infection. It is doubtless a good axiom to believe that a tonsillitis with exudate is diphtheria until it is proved not to contain the Klebs-Loeffler bacillus. Such a patient should be isolated, as streptococcic infection is, if anything, more readily communicated than is a diphtheria infection. Therefore, there can be no excuse for not isolating a sore throat with exudate or membrane as soon as such a case is discovered.

The location of the Klebs-Loeffler bacillus in carriers who are convalescing is probably most frequently in the throat, though the bacillus may be found in the nose. In those who carry these germs long they are more likely to be found in the nose. Therefore, swabs should be taken from both regions. It is quite probable that a surface swab from a tonsil may be negative while a culture obtained from probing into crypts of the tonsils or in the region back of the tonsil might show the presence of the germ. It is culpable neglect to fail to examine a patient thoroughly to ascertain if he is free from the Klebs-Loeffler bacillus.

The boards of health vary as to the number of negative cultures that will release a patient from quarantine. The safest number is perhaps four negative cultures, two from the throat and tonsils, one from crypts or back of the tonsil, and one from the nose, taken on alternate days, at a considerable interval from the use of any antiseptic washes, gargles or sprays. This would seem to prove that a patient was free from the Klebs-Loeffler bacillus.

#### TREATMENT OF CARRIERS

Various methods of ridding a carrier of the diphtheria germs have been tried. Local measures vary: they may comprise painting the suspected regions with tincture of iodine or with Lugol's solution, with silver



solutions, phenol solutions; or the use of various gargles, hydrogen peroxid solutions, etc., and the nasal inhalation of various thymol or iodine inhalants or sprays. There is no question that whatever else is done, some local antiseptic should be applied. Diphtheria antitoxin injection has not been very successful. Local applications in the mouth, throat or nose of antidiphtheritic serum have not been proved to be very successful. Vaccinations with dead diphtheria bacilli have been only partially successful. Albert states that a local application to suspicious crypts of the tonsils of a "5 per cent. solution of silver nitrate will destroy all bacteria with which it comes in contact." A thorough application of a 10 per cent. solution of silver nitrate he finds will cause some destruction of the epithelium of a crypt and a fibroblastic proliferation with ultimate obliteration of the lumen, which is of course the object desired.

Hektoen and Rappaport found that, when properly applied, kaolin in the form of a dry powder removes not only diphtheria bacilli but also practically all bacteria from the nose in the course of from three to four days. For this purpose the kaolin is blown into the nose six or seven times a day at two-hour intervals by means of a rubber bulb attached to a glass tube, the free end of which tapers a little. The insufflation is repeated several times at each treatment. The success of this treatment appears to depend largely on the free and thorough distribution of kaolin over the nasal surfaces. In cases of more or less obstruction of the nasal passages, the removal of bacteria by insufflation is more difficult.

In order to secure the most thorough application of kaolin to the mucous membrane of the throat, patients, if old enough, are instructed to swallow as slowly as possible one-third teaspoonful of kaolin four or five times an hour during the day. In the case of adults and older children who are anxious to get rid of diphtheria bacilli, this method, which has been selected after trial of several others, involves no special difficulty.

A careful examination of carriers frequently discloses some local condition which allows the bacteria to live



and grow and which prevents their being reached by any local application. Friedberg studied such cases after removing the tonsils and found that cultures became negative at once or very shortly. Similar favorable results from tonsillectomy have been reported by other clinicians and laboratory workers. There seem to be no contraindications to the operation aside from those obtaining in other conditions. Local conditions in the nose and throat other than those in the tonsils may determine the presence of the bacilli and should be sought and relieved whenever possible.

### IMMUNITY

While it has been long known that infants and many adults seem not to be susceptible to diphtheria, it has only lately been shown that probably a large proportion of adults, stated at 90 per cent., perhaps 50 per cent. of children, and perhaps 80 per cent. of newborn infants have diphtheria antitoxin in their blood and are not likely to become ill with diphtheria.

A skin test has been devised, known as the Schick reaction, to determine whether or not a person is protected against diphtheria, that is, whether he has diphtheria antitoxin in his blood. The reaction distinctly shows that a person is artificially protected or has natural antitoxin against this disease. The test is made with a dilute diphtheria toxin of such strength that 0.1 c.c. contains one-fiftieth of the minimum fatal dose for a guinea-pig. This amount, namely, 0.1 c.c., is injected between the layers of the skin, perhaps best on the inner surface of the arm. A positive reaction should appear in from twenty-four to forty-eight hours, and is evidenced by a slight swelling and localized redness, a reddened papule which remains from seven to ten days. When this papule disappears, the skin over it may desquamate slightly, and pigmentation may remain for days and even weeks. The injection is best given with a small hypodermic syringe with a platinum point needle, it must be into the skin and not subcutaneously, and immediately after the injection there should be a raised whitish spot, which in twenty-four hours becomes bluish, with a slight edema. Schick's interpretation of the positive reaction, as just

described, is that the patient has no antitoxin in his blood, or at least less than  $1/30$  unit of antitoxin in 1 c.c. of blood. He declares that all persons so reacting are susceptible to diphtheria. Park, in his summary on immunity in diphtheria, states that according to Hahn the interval between the injection of vaccine and the development of antitoxin is not less than three weeks, while other investigators think that it may be eight days. Persons who have a natural antitoxin show an earlier increased antitoxin production. Von Behring considers that 0.01 unit of antitoxin per 1 c.c. of blood is sufficient to protect a healthy individual, and much less may protect against diphtheria.

Immunizing doses of antitoxin to persons who have been exposed to diphtheria, given early, are generally successful in preventing the development of the disease. The immunizing dose for a child should probably be at least 1,000 units. Adults may receive larger doses.

#### IMMUNIZATION WITH TOXIN-ANTITOXIN

It has been shown through research that a more durable immunity against diphtheria is established by the use of a mixture of diphtheria toxin and diphtheria antitoxin than by the latter alone. The immunity does not appear until a considerable period of time has elapsed and for this reason the mixture is not especially useful at the time of an outbreak of diphtheria. At these times it is probably better to rely on the diphtheria antitoxin alone.

Various mixtures of toxin and antitoxin have been suggested and numerous preparations are on the market and have been described in New and Nonofficial Remedies. Most clinicians advise the overneutralized mixtures, for instance five lethal plus doses of toxin to 6.25 units of antitoxin. Several doses are usually required to produce immunity. These preparations are especially useful in schools, asylums, homes, etc. and among those persons who frequently come in contact with diphtheria patients, such as physicians, nurses and attendants in contagious disease institutions.

Zingher has suggested that all infants below twelve months and, if possible, below eighteen months of age, be actively immunized with three doses, each 10 c.c. of

the toxin-antitoxin mixture. The injections are given subcutaneously in the arm or below the angle of the scapula, and repeated every seven days. In older children he advises the use of the Schick test as an indication for immunization.

Toxin-antitoxin immunization has now been tried on thousands of cases with markedly successful results and in the presence of cases of diphtheria in the home or of an epidemic in the community, its use for immunization should have early consideration.

#### TREATMENT

*A. Isolation.*—It should be again urged that a throat with spots or membrane should be considered as likely to be diphtheritic until a culture has proved it not to be. Such a patient should be isolated in the best room available, looking toward the possibility of the disease being diphtheria and a nurse being required. Other children of the family must be excluded from contact with this patient. If the case is clinically one of follicular tonsillitis, the physician may wait for a positive test before giving antitoxin. If, however, the case is clinically diphtheria, antitoxin should be given without waiting for a report, provided there is nothing in the history of the patient to show that there will be any hypersusceptibility to horse serum. Whether it is follicular tonsillitis, or other streptococcic infection, or diphtheria proper, gargles and local cleanliness of the throat should be immediately inaugurated, and when this is properly carried out, the danger of infection of others is reduced to a minimum.

It is hardly necessary in this day, in which the advisability of sunlight, a large room, an adjacent bathroom, the absence of all unnecessary draperies, furnishings, rugs, etc., for a proper isolation room are so well understood, to describe again the needs in detail. Instruction should be given the family in the minor details of the prevention of infection of others. A properly trained nurse well understands the necessity for burning wooden tongue depressors, wooden applicators, the gauze and cotton used around the patient's nose and mouth, and washcloths; the use of liquid

soap; simple but effective cleanliness of the patient's face, hands, and body; boiling of all eating and drinking utensils; disinfecting the toothbrush with non-poisonous germicides; allowing the bed clothing and bed garments to stand in germicidal solutions before being sent to the wash; frequent washing of her own hands in germicidal solutions; and gargling her own throat with various solutions.

*B. General Care of Patient.*—High fever is not frequent in diphtheria, unless the case has been neglected. Consequently, the patient should receive, almost from the beginning, plenty of nutritious food. The exact diet, of course, depends on the age of the patient. Milk, oatmeal gruel, eggs, meat juice well salted, toast, butter, and the whole, or the juice, of one or two oranges, would represent the food needed. With or without meat, it is well to give a diphtheria patient iron, and no preparation is better than the tincture of iron chlorid in 5-drop doses, three times a day, given in fresh lemonade or orangeade, after nourishment.

However well the gastric juice inhibits the growth of the bacteria, it is always wise for a patient to gargle, or be sprayed, before taking food, so that the mouth and throat will be as clean as possible.

The bowels should be moved daily by some simple laxative, if they do not move without such help.

While a diphtheria patient should have plenty of fresh air and all the sunlight possible, he should be kept warm. He should not be allowed to become chilled, as the toxins of this disease cause depression and the patient's temperature may be quite low, and the hands and feet easily become cold. Even if the temperature is high, the bathing should be by warm sponge baths.

*C. Antitoxin.*—Recent investigations by Schick show that the dose of antitoxin advisable for ordinary cases of diphtheria can be based on the weight of the patient. Schick finds that 100 units of antitoxin per kilogram of weight is sufficient to combat the toxin in diphtheria in all ordinary cases, and in severe cases 500 units per kilogram is more than sufficient. In other words, enormous doses of antitoxin are not



needed. This is especially true if the antitoxin is given early. A kilogram equals 2 1/5 pounds avoirdupois, and a child weighing 45 pounds, in an ordinary case of diphtheria, should be given 2,000 units of antitoxin; while if the case is severe, or in nasopharyngeal or laryngeal types, 10,000 units would be all sufficient. By the same method of decision as to the dose, an adult of about 130 pounds should receive 6,000 units in a mild case, and 30,000 units if the diphtheria is of malignant type, or has affected parts where the danger of absorption is greater.

It seems quite probable that if such doses can be administered on the first day of the infection with the Klebs-Loeffler bacillus, no more antitoxin will be needed in such cases, and that death from this disease will be reduced to a minimum.

Smith and Park have shown that when antitoxin is given subcutaneously, it takes from three to four days before the maximum amount of antitoxin is circulating in the blood. If the antitoxin is given intramuscularly this period is shortened. From these findings, therefore, the conclusion should be made that if the case is urgent and the toxemia serious, antitoxin should be administered intravenously; if the case is severe and the diagnosis has not been made early, antitoxin should be given intramuscularly; in ordinary or mild cases, and on the first day or two of the disease, it may be administered subcutaneously.

The possibility of an anaphylactic reaction should not prevent the use of antitoxin in a patient with diphtheria, even though he has previously received antitoxin for immunologic or curative purposes. In such persons it is advised to give a small amount (from 0.1 to 1 c.c.) subcutaneously; if no severe symptoms appear after one or two hours, the full dose may be given.

Several considerations make it difficult to state the probability of appearance of anaphylactic phenomena in any given case. In addition to individual peculiarities which no doubt play a part, the volume of serum injected and the method of preparation of the serum are important factors. Weaver (*Arch. Int. Med.*,



June, 1909, p. 485) found that when the volume of serum was small (from 1 to 9 c.c.), serum disease (urticaria, erythema, arthritis, etc.) appeared in 10.9 per cent.; with increasing volumes of serum, the percentage of reactions progressively increased so that in those cases receiving from 80 to 280 c.c., serum disease was noted in 61 per cent. The more recently developed methods of concentrating and refining antitoxin yield serums of high potency, so that the necessary amount of antitoxin units is available in small volume of serum, and the probability of serum disease is accordingly decreased. The removal by the refining process of certain albumin fractions of the serum decreases the incidence of serum disease. The older statistics, therefore, probably show a higher incidence of reactions than are being obtained at present with concentrated serum.

In persons receiving serum for the first time, serum disease appears in the majority of cases from the seventh to the tenth day, but sometimes earlier or much later, and rarely need cause alarm. Of 200,000 persons injected with serum, there was but one death from anaphylactic shock (Kolle).

The reactions which follow reinjections of serum (that is, in persons previously injected) may be immediate, and in any case are likely to occur earlier than those after first injections (accelerated reactions). The immediate reactions usually present, in addition to urticaria and other symptoms of serum disease, symptoms of respiratory disturbance, cyanosis, rapid pulse, etc., and correspond to the anaphylactic shock seen after reinjection of experimentally sensitized animals. Epinephrin and atropin have been used with benefit. Even these severe reactions are very rarely fatal. About 50 per cent. of fatal instances of anaphylaxis have occurred in asthmatics, and in some of the latter the fatality followed the first injection of serum. When the reinjection is made within six days after the first injection in man there is practically no danger of anaphylaxis; reinjection in from three to eight weeks after the first injection is followed by some degree of anaphylaxis in about 90 per cent. of cases; reinjection after six to nine months is followed by reaction in about 50 per cent. of cases (Seidel: *München. med.*

*Wchnschr.*, 1915, lxii, 1210.) With the lapse of years the percentage of reaction on reinjection is further decreased, and usually appears as an accelerated reaction.

The danger of serum reactions even in previously injected persons is so much more remote than the danger from diphtheria that the physician should not hesitate to avail himself of so potent a remedy as anti-diphtheric serum.

*D. Care of the Throat.*—It would be just as sensible to perform a major operation with the most perfect technic and yet take no means whatever of preventing infection, as it is to administer antitoxin in proper dose in diphtheria and then to take no proper care of the throat. All odor and all danger of secondary infection are removed by proper treatment of the part affected. Although germicides cannot kill the germs deep in the mucous membrane, or those that are protected by an overlying exudate, a certain large portion of the surface bacteria are surely killed by as simple a gargle as hydrogen peroxid solution. More active and more irritant germicidal gargles or germicides that are sources of danger when swallowed, are entirely unnecessary in diphtheria.

If the child is old enough to gargle or swash the tonsils, this is the best method of cleansing the throat. If the child is not old enough, thorough spraying of the throat should be done. A solution of one part of the official aqua hydrogenii dioxidi to 3 parts of warm water, freshly prepared each time, should be used as a gargle, every one and one-half or two hours during the day, and every three hours during the night. Three or four minutes after this gargle has been used, it should be followed by some simple alkaline wash, to remove the irritant effects of the hydrogen peroxid. A gargle that may be used for the secondary cleansing purpose is a teaspoonful of boric acid added to  $\frac{1}{2}$  glass of warm water. This will not all dissolve, but will deposit on the throat and act as a mild antiseptic. Also, there is no greater promoter of mucous secretion of the throat than boric acid; and the more the mucus is secreted, the quicker will the membrane be loosened. Or, a simple solution of  $\frac{1}{4}$  teaspoonful of salt and  $\frac{1}{4}$  teaspoonful of sodium

bicarbonate may be added to  $\frac{1}{2}$  glass of warm water. The object of such a gargle and wash is to cleanse the mouth and throat of froth and pieces of membrane, mucus, mucopus, etc., and to soothe the membrane. It is frequently advisable to insufflate boric acid directly on the masses of membrane or exudate. This should be done by the physician.

After the throat has been cleansed, it is often of value to apply tincture of iodine to the membrane or exudate. Care must be taken not to touch the healthy membrane with this solution. Lugol's solution may be applied to the parts of the throat that are not affected, which often tends to prevent development of more exudate or membrane. If there are pockets and crypts in diseased tonsils, after cleansing such, boroglycerid may be applied to heal and to prevent spreading of infection.

As frequent gargling is very tiresome for the throat, swashing is nearly, if not quite, as efficient, and should be suggested. If the child is too young to gargle or swash, the peroxid should be sprayed on, and the solutions for this purpose should be stronger, namely, 1 part to 2 parts of warm water. The cleansing spray may be used afterward. If the throat and mouth generally are irritated, a soothing gargle is as follows:

	Gm. or C.c.	
R Acidi borici.....	2	gr. xxx
Potassii chloratis.....	5	3 iss
Aquae menthae piperitae...	200	flʒ vii

M. Sig.: Use undiluted as a gargle, as directed.

Of course, any other flavor than peppermint could be used in this mixture.

Whether or not it is advisable to use a weak hydrogen peroxid solution in nasal diphtheria is a question for individual decision of the physician; generally it is too irritant, even when used weak, and is inadvisable. Cleansing mild alkaline solutions or boric acid solutions represent the most successful treatment of nasal diphtheria used as sprays or snuffed through the nostrils. Such mild, warm solutions may be poured from a small vial or from a teaspoon into the nostril, with the head thrown back. It is inadvisable to use

any of the douches that are on the market, or any syphon douche, as the pressure is too great, and fluid is often forced up the eustachian tube or into some of the sinuses. Suprarenal extract may be added to these solutions, if deemed advisable, but it should not be used too frequently. Also, the nose should not be sprayed too frequently.

As soon as the throat is clean, the frequency of the gargles should be diminished, but it should be several days before the patient is not awakened at night to gargle at least once, or better, twice.

The treatment of the throat advised for diphtheria is equally applicable to follicular tonsillitis or scarlatinal throats, and to septic sore throat.

*E. General Medication.*—A diphtheria patient requires very little general medication, unless some complications occur. In the beginning a small dose of calomel, or a dose of castor oil may be advisable, and subsequently whatever simple laxative is needed to cause a daily movement of the bowels. The temperature does not often call for treatment. If it is high, or there is headache and backache and general aches, two or three small doses of a coal-tar antipyretic may be given. The following combination for a child not under 10 years old is efficient:

	Gm. or C.c.	
R Acetphenetidini .....	1	
Phenylis salicylatis.....	1	ãã gr. xv
M. et fac chartulas v.		
Sig.: A powder every three hours, if needed.		

Later, if the temperature is high, tepid sponging is sufficient, but generally, with the ordinary low temperature of diphtheria, hot sponging for cleanliness and to increase the activity of the skin, and to remove the perspiration, should be done once or twice daily.

As suggested above, every patient with diphtheria should receive iron, either the tincture of iron chlorid. a few drops in fresh lemonade, or a 3-grain tablet of eisenzucker, three times a day, or 0.10 gm. (1½ grains) of reduced iron, in capsule, three times a day. If there is a tendency for the throat or nose to bleed, it can do no harm to add lime water to the diet, and it may be of value.



On account of the nervous depression caused by the toxins of the Klebs-Loeffler bacillus, a small dose of strychnin, not exactly as a cardiac stimulant, but more as a nervous stimulant, is advisable, provided the condition of the patient seems to require it. For a child 10 years old,  $1/60$  grain of strychnin sulphate, once in six hours, is generally a sufficient dose. If the child is made nervous by strychnin, it should certainly be withheld. A little coffee or tea may be given a child, as a medicine for the action of the caffeine, and is of value.

*F. Care of the Heart.*—Although it was long considered that heart failure in diphtheria was due to vasomotor paralysis, or to action on the vasomotor center, it has been shown by Porter and Pratt that such is probably not the case: that heart failure is probably due to the action of the toxins on the heart itself. Dr. F. W. White of Boston long ago showed that the heart was frequently affected more or less seriously in diphtheria. White also quotes many other authorities showing that myocarditis is not an infrequent complication, that valvular disease may occur from diphtheria, and that even a chronic myocarditis may persist, or a valvular lesion may continue for months or even years, or for life. The mitral valve is the one most frequently diseased, and if a lesion is caused, it is generally insufficiency. About 60 per cent. of the patients with diphtheria show an irregular pulse, and the younger the patient, the more liable he is to have this heart irregularity. It may occur even in mild cases. The murmur at the apex is doubtless due to a relative insufficiency of the mitral valve, because of slight dilatation of the left ventricle. In this investigation, necropsies showed that endocarditis and pericarditis are not extremely rare complications in diphtheria.

Clinically, the gallop rhythm, with or without vomiting and epigastric pain and tenderness, is a bad symptom in diphtheria. This gallop rhythm of the heart is very serious, and if accompanied by vomiting, the prognosis is very bad. Hume and Clegg, after an investigation of 573 cases of diphtheria, declare that any form of arrhythmia of the heart (except sinus



arrhythmia) in diphtheria indicates that the heart muscle or nerves are pathologically disturbed. This may occur even when the diphtheria is apparently mild.

After a patient is apparently well from diphtheria, if he has been severely ill, and especially if the case has been neglected and a large amount of toxins have been absorbed, cardiac failure may occur any time from the second to the fifth week. Symptoms of late cardiac weakness are often a slow, weak pulse. Such hearts, however, become rapid on the least exertion. Such patients are often very pale, and there are liable to be more or less gastro-intestinal disturbances.

There can be no question that the effects on the heart in diphtheria are due to the Klebs-Loeffler bacillus toxins; consequently, if antitoxin in sufficient dose is given early, the toxic effect on the heart will probably rarely occur. Consequently, cardiac deaths in diphtheria will be less frequent with the early proper administration of antitoxin.

The most important treatment of cardiac complication is rest, and prolonged rest. A patient who has shown cardiac inflammation of any kind, or cardiac irritation during diphtheria, should have a prolonged rest in bed and a very slow convalescence. The small dose of strychnin suggested above as a nerve stimulant is probably sufficient. If the heart is very rapid, it may be unwise to give even this small dose. Larger doses do not seem to raise the blood pressure during illness, and strychnin in large doses as a cardiac tonic, in prolonged weakness, is not so successful as has been thought. In an apparently acute failure, a fair-sized dose, 1/40 grain for a child 10 years old, may be given hypodermically; but to persist in large doses of strychnin is inadvisable. Digitalis is not indicated, and alcohol should not be given. Caffein and camphor may be worth while; but the main thing is absolute rest, small amounts of food, and the least possible disturbance for bathing, feeding, defecation and urination, and no prostrating purgatives.

*G. After Rest.*—A patient who has recovered from diphtheria, however mild it may have been, should have, for the first two weeks, at least, a carefully watched convalescence. Strenuous exercise should be

avoided, and the heart should be carefully examined before the patient is allowed to return to his usual work, school, or play.

*H. Paralysis.*—With the early injection of a sufficient dose of antitoxin, diphtheria paralysis will become less and less frequent. The paralysis of the soft palate, which used to be so frequent, is already becoming infrequent. This paralysis occurs early, between ten and twenty days from the beginning of the illness. The treatment consists of tonics, small doses of strychnin, the best of nutrition, fresh air, sunlight, rest, and prolonged convalescence. The general paralyses, which are now rarely seen, were more serious, and occurred later. They are slow in recovery, and besides general treatment, require massage and electricity.

*I. Diseased Tonsils.*—Quite probably diseased tonsils cause a susceptibility to diphtheria, as they certainly do to follicular tonsillitis. After complete recovery from a diphtheria attack, when the general condition is perfect, and the heart is in good condition, operations should remove all tonsils that show disease.

## LARYNGEAL DIPHTHERIA

Membranous croup is laryngeal diphtheria, and as soon as the diagnosis can be made that there is exudate in the larynx or laryngeal region, antitoxin should be given in large dose, without waiting for a decision from the laboratory that the Klebs-Loeffler bacillus is present. The only safe place for a patient with laryngeal diphtheria is a contagious disease hospital, where expert skill in intubation and, if necessary, in tracheotomy can be quickly obtained. The main danger from diphtheria in this location is suffocation.

The toxemia is not great, and the absorption is much less than in nasal, nasopharyngeal, or even in tonsillar diphtheria.

The best of nutrition is important, as exhaustion from labored breathing is likely to occur. The atmosphere of the room is better moist, on account of the membrane becoming dry and causing more obstruction before it loosens and is coughed up. Just how much local steaming of the throat, or inhalation of

various medicated solutions should be given, is to be decided by the individual physician. The main advantage is doubtless from the vapor of water.

The main requirements to be remembered in laryngeal diphtheria are the administration of an immediate large dose of antitoxin; intubation by a skilled operator as soon as indicated; a trained nurse skilled in intubation cases, if such can be obtained; the ability to recall quickly the physician who intubated if the tube is coughed up; the immediate removal by the nurse of the intubation tube if it plugs up, and the quick performance of tracheotomy by the surgeon, if such a measure is needed.

### SEPTIC SORE THROAT

For some years there have been reported epidemics of septic sore throat, some of which have been distinctly traced to infected milk, and all of which probably develop from that source, or by transmission directly from active cases. The germs found in the inflamed udders, in the raw milk, and in the throats of those infected are the same, namely, the *Streptococcus pyogenes*.

The clinical symptoms have been the same in all of these epidemics. The throats generally show intense hyperemia without a grayish exudate. The cervical lymph glands enlarge, and may suppurate; there is extreme prostration, and a tendency to relapse. The complications are inflammation of the middle ear, abscess around or about the tonsils, and erysipelas or other skin eruptions. The most dangerous and fatal complication is peritonitis, and there may be fatal septicemia, with localization in the lungs. Endocarditis, myocarditis, arthritis, and nephritis may occur as complications in this septic process.

Means of prevention of septic sore throat in epidemics must include a more frequent bacteriologic examination of the udders of cows and of the throats of those who handle raw milk. Pasteurization of milk prevents the germs from causing infection.

The treatment of septic sore throat is not different from that of follicular tonsillitis, namely, application of dilute hydrogen peroxid solutions 1:4, immediate sub-

sequent washings with mild alkaline cleansing solutions, and the local application of a weak iodine solution, as Lugol's solution (too strong iodine preparations might increase the swelling and hyperemia of the throat).

On account of the prostration, the patient should receive plenty of nutriment. The bowels should be moved daily. Pain should be stopped, if it is troublesome, by codein or morphin, if deemed advisable. High temperature should be treated as seems best, and the complications combated as they occur. Infection of others is prevented by the same methods as those described for diphtheria. After recovery the removal of infected tonsils should be considered.

### RUBELLA (GERMAN MEASLES)

This is a highly contagious disease, most frequently affecting children and youth. It generally occurs in epidemics, but a considerable number of persons exposed to the disease do not acquire it. While the germ has not been discovered, and though it is not known just how it is transmitted, the probability is that the secretions of the nose and throat are the means of spreading the infection. It is doubtful if the eruption or the desquamating epithelium carries the contagium. The stage of incubation is apparently long, averaging perhaps from about ten days to two weeks. The stage of invasion is rarely seen, as when it is first realized that the patient is ill, the eruption is present. The eruption is a maculopapular one, reddish, and rarely confluent. The papules are less raised than in measles; in fact, many points of eruption are purely macules. The color is brighter than that of measles. It occurs first on the chest and face, and then gradually spreads over the body, during the first twenty-four hours. Questioning of the person attacked often shows that there were slight rigors and some backache or headache or feelings of indisposition. The temperature is generally slight, rarely above 100 F. An occipital adenitis, with swelling of the post-cervical glands, is a very frequent accompaniment of the disease.



Complications are rare. Although the patient should be confined to the house, the infection is simple, and there are not likely to be complications or sequelae.

This disease requires, ordinarily, no radical treatment. Simple cathartics should be given, the diet reduced, and the patient kept indoors until the eruption has disappeared. If the throat is irritated, an alkaline gargle should be used. Boric acid, 2 per cent. to 4 per cent., or Dobell's solution, one-fourth strength, may be used for this purpose. The usual simple methods of preventing the infection of others should be carried out. It is well to isolate the patient from other children in the family for at least three weeks.

The disease should be made reportable, as it is so often confused with regular measles, and, rarely, has been confused with mild scarlet fever. It is more likely to be confounded with various kinds of intestinal or food poisonings that cause eruption.

### CHICKEN-POX; VARICELLA

This simple, acute, contagious disease, generally very mild, and rarely requiring any medication or treatment, need not be mentioned here except that it is frequently confused with smallpox.

In chicken-pox: The incubation period is at least two weeks. There is no definite history of a previous attack of this disease. A history of successful vaccination within a few years, or a definite history of a previous smallpox causes presumption that the disease is chicken-pox. There is usually no history of a stage of illness before the eruptive stage. The eruption appears in the first twenty-four hours of the disease, beginning on the back, chest or face, and is most profuse on parts of the skin covered by clothing. The eruption appears in successive crops on successive or alternate days, so that various stages of the lesions may be present at one time. The lesions are round and oval, and the margins are not crenated. The eruption passes through the following stages: 1. Macules lasting a few hours. 2. Soft, superficial papules lasting a few hours. 3. Clear, thin-walled, tense vesicles each lasting a few hours (these vesicles may be readily broken and appear cupped or pitted, and the weeping vesicle then quickly becomes crusted).



4. The crusts, lasting a shorter or longer time, depending on the treatment (each crop completes its cycle from macule to crust in from two to four days).
5. Pitting may occur, but the pits are few, superficial, and often oval.

It is essential that chicken-pox cases should be early diagnosed, and that the patient should be isolated. A laxative should be given; the diet should be simple and without meat; warm baths, and powder to prevent itching, represent the only treatment generally required. Older patients should be cautioned, and children should be prevented from picking open the vesicles that occur on the face, thus preventing pitting. Young children should wear celluloid mittens. To control the itching of the skin it may be dabbed with a weak solution of bicarbonate of soda, one dram to the pint or four grams to 500 c.c.

### MUMPS

This is a highly infectious disease, with a long period of incubation, from two to three weeks. The causative organism is not known, though a diplococcus or streptococcus has been found by Laveran, Catrin, Herb and Rosenow. Wollstein found that the saliva of those infected contains a filterable infective agent. The virus is most readily detected in the saliva during the first three days of the disease, less readily on the sixth day and not at all after the ninth day. This has some bearing on the question of infectivity and the length of isolation period for mumps patients. There is more or less mumps always present in most cities, and there are likely to be epidemics of it in certain seasons of the year, more particularly, perhaps, in the spring and fall. Children and youths, especially boys and young men, are the most susceptible to it. Infants and adults are less likely to have it because they have been rendered immune by unrecognized mild attacks in childhood.

While the typical localization of this infection is in one or both parotid glands, the submaxillary glands may be coincidentally involved, or may be the only glands involved. As simple and harmless as this disease generally is, it may cause very high temperature, sudden cardiac failure, and frequently in young boys

and male adults a complication, or metastasis, of orchitis, which is always serious. In girls the mammary glands or the ovaries may show metastatic inflammation.

A patient with the disease should generally be isolated, and the attack will often be milder if the patient remains in bed. Of course, an infected child, even though very mildly sick, is immediately sent home from school. On the other hand, doubtless not a few children with very mild cases are unwittingly allowed to remain at school.

#### TREATMENT

The disease is so mild that it may not require special treatment. Pain in the infected glands is rarely severe, and is modified by dry warmth or simple absorbent-cotton applications, and by any oily application, the latter to relax the tension of the skin over the swollen gland. For this purpose olive oil may be used, or petrolatum, or an ointment may be made with 10 per cent. methyl salicylate in petrolatum. It is inadvisable to use ice or cold applications to the parotid glands in mumps.

The diet should be mild, the bowels kept free, and in simple cases medicinal treatment is not needed. If the fever is very high, one or two doses of antipyrin or acetanilid may be given, with the knowledge that cardiac depression readily occurs in this disease. Hot drinks, as hot lemonade or tea, with perhaps a Dover's powder for its physiologic action in dilating the peripheral blood-vessels and promoting perspiration, is a satisfactory method of reducing the temperature. Tepid sponging may be of benefit, and hot sponging should be given the patient daily if he is too ill for a hot bath.

If a testicle is affected, the lesion is generally an orchitis, or it may be an epididymitis. Warm, moist applications often relieve pain; but if the testicles are kept elevated and surrounded by absorbent cotton, and if some oil or fat, such as petrolatum, is applied, the inflammation will probably go away as rapidly as by any other treatment. Strapping is inadvisable in this complication. Massage, or rubbing in of any ointment or other preparation in this kind of orchitis, or any

such treatment of the parotid glands, is inadvisable in mumps. Ichthyol applications in from 10 to 20 per cent. strength either in petrolatum, in olive oil, or in glycerin and water, have been largely used locally in this inflammation. The less these inflamed glands are manipulated the better.

If the mammary gland becomes metastatically inflamed, the treatment is about the same as that for the parotid. If it is decided that the ovary is inflamed, but little can be done, except absolute rest and the administration of a sedative, if there is pain. If there is much pain from any of these inflamed glands, morphin or codein may be advisable, if it seems unwise to give a coal-tar analgesic.

The period of isolation should be about twenty-one days.

### EPIDEMIC MENINGITIS

This disease occurs in epidemic and sporadic forms. In the latter case it is often difficult of diagnosis. While young children and young adults are most often attacked, it occurs not infrequently in camps, or in other groups of closely associated persons. The sporadic form is always more or less present in most cities. Epidemics appear, both in this country and in Europe, most frequently in the winter and spring months, and the greatest number of sporadic as well as epidemic cases occur during March, April and May.

The cause of epidemic cerebrospinal meningitis is the *Diplococcus intracellularis meningitidis*, also called meningococcus, which was first described by Weichselbaum, in 1887. These cocci are found in the spinal fluid. It has been found that a second lumbar puncture made a few hours after the first or a drawing of the spinal fluid so as to get some of the fluid from the brain more frequently yields the organisms than the first fluid coming from the puncture needle. This indicates again that the organisms may reach the brain directly from the nasal passages before reaching the spinal cord. In appearance the organisms are very much like gonococci, and lie in pairs either in or near the leukocytes. These germs are also found in the secretions of the nose and nasopharynx. The meningococcus is of low vitality and is readily killed by sun-

shine, drying and by freezing; therefore, with ordinary precautions the danger of contagion is slight. As in so many other diseases, carriers of this germ have been found, and they probably play a considerable part in the spread of epidemics and in the occurrence of sporadic cases.

Dopter was the first to classify meningococci into distinct types. Today four different types are commonly recognized. It was found as a result of experience in the war that treatment with serum against one type was not efficient against others. As a result efforts should be made if possible to have type determination made by a reliable laboratory as early as possible in cases of this disease.

From these facts meningococcus cerebrospinal meningitis should be made a reportable disease, whether occurring in sporadic or epidemic form, and carriers should be sought, and when discovered, isolated and treated.

In the first place, it may be noted that rarely has the disease attacked an individual more than once. In the second place, carriers have become more or less immune, but it is self-evident that, having been discovered, although close contact is needed, and though the germ is not sturdy and is readily killed after leaving the body, they must be isolated and treated. Therefore, the persons immediately surrounding a case of meningococcic meningitis should have the secretions of the nose and nasopharynx examined for this germ. It has not been shown just what local treatment of the nose and throat of these individuals is advisable, but antiseptic sprays, swabbings and gargles are certainly indicated.

Vaccinations, with dead meningococci, of children who have been directly exposed to the disease, and of the nurse or other persons, who must care for cerebrospinal fever patients has been suggested in preventing the spread of the disease. It has been suggested that a moderate amount of immunity would be sufficient to prevent this particular infection. How long such immunity would last is not known. Vaccination with this germ causes a febrile reaction, with leukocytosis. Meningococcus vaccines are now prepared, and can be readily obtained.



The symptomatology need not be considered here. It should be remembered, however, that the disease may be systemic with an eruption, as witnessed by its old name, "spotted fever."

#### TREATMENT

During the war Herrick and others discovered many cases of meningitis which were definitely of the systemic type. The symptoms were a petechial rash, arthritic pains and complications such as panophthalmitis, endocarditis, pneumonia, pleurisy and orchitis. These findings indicated a wide dissemination of the organism in the blood stream. In such cases intravenous serum therapy accompanying the intraspinal treatment was of marked benefit. Massive doses of antimeningococcus serum were introduced in this way. The patient was desensitized by the injection of 1 c.c. of serum subcutaneously. One hour later from 80 to 150 c.c. of serum were given by vein, the first 15 c.c. at the rate of 1 c.c. per minute. The remainder was allowed to flow more rapidly. In severe cases this dosage was repeated every eight to twelve hours and in mild cases every twenty-four hours until the symptoms subsided. The intraspinal therapy is not to be neglected.

Dopter believes that polyvalent serum should be used only until type determination is made when the monovalent serum should be employed. With these intravenous or intramuscular injections should be combined.

If the fluid taken from the spinal canal is cloudy, immediately inject antimeningitis serum, warmed to the body temperature. Inject slowly. The dose for an adult is from 20 to 40 c.c., and for infants and children from 3 to 20 c.c., the amount largely depending on the quantity of fluid withdrawn. The dose should usually be from 5 to 10 c.c. less than the amount of fluid withdrawn. Occasionally in true meningococcic meningitis no fluid flows from the canal in spinal puncture, so-called dry tap. In such cases a small amount of the antiserum may be injected, with careful watching of the patient to note changes in pressure as determined by the character of the pulse and respiration. In severe cases the antiserum is



injected every twelve hours until there is improvement. In moderate and mild cases the injection is repeated once a day for four days. The bacteriologic findings of the fluid withdrawn at the last injection, and the condition of the patient, determines whether the anti-serum should be longer given. Usually from four to six injections are necessary, but more are given if required. On successive punctures and injections the patient is turned first on one side and then on the other, which insures the emptying of the lateral ventricles in rotation. In other words, a patient who lies on his right side for one puncture will be placed on his left for the next.

In some instances following injection of serum the patient may go immediately into a condition of shock, with the respiration shallow, the face pale, and the pulse rapid and thready. The needle is immediately lowered and the fluid allowed to flow from the canal. Artificial respiration should be resorted to if the breathing has ceased, and hypodermic stimulation of the heart should be given. Large doses of epinephrin may be given intramuscularly. This condition of shock does not occur frequently with the smaller doses that are now administered.

When the condition of the patient is such that intraspinal injection of serum cannot be made Herick and others have suggested large intravenous injections, followed by drainage of the spinal fluid. Dopter has pointed out that there may be obstruction in the spinal canal which prevents passage of the serum throughout and that in such cases injection at other points than in the lumbar region may be advisable. He also suggests that possible beneficial effects may be secured by the production of fixation abscess through the subcutaneous injection of 2 c.c. of turpentine. He also suggests the use of from 100 to 500 million meningococci killed by heat at 55 C. In some of his cases marked benefit followed this treatment when the patients did not respond to the serum treatment.

Cerebrospinal fever demands the best hygienic surroundings obtainable, and a quiet, cool, darkened room, as in any meningitis. The bowels should be thoroughly moved in the beginning, and then, daily, or every other day, the patient should receive a laxative, if needed.

As the vomiting is reflex, stomach sedatives are of no avail. As the central condition is improved or the patient becomes more stuporous, the vomiting will cease. Food in the early stages should not be pushed, as there is great repugnance to it. Plenty of water, and later simple cereal gruels and milk should be the early diet. The subsequent diet should depend on the height of the fever and the ability of the patient to digest. In the stage of convalescence food should be pushed, if it is well digested. Through the active illness, starches should be given to prevent acidemia. If the pain is sufficient to require sedatives, much food should not be given, as it will not well digest.

A most important symptom of this disease is likely to be pain, and there is no excuse for allowing a patient, because it is a young child, to suffer pain. Morphin or codein represent the most efficient and the safe narcotics, the dose, of course, being regulated according to the age of the patient and the effect. Generally it is better to administer a very small dose hypodermically than a large dose by the mouth; the action of the whole dose is obtained, and there is no doubt as to whether or not it is absorbed. Ergot given in aseptic form, intramuscularly, not only seems to act as a sedative to the nervous system and possibly diminishes congestion, but it certainly prolongs the action of any dose of a narcotic. Less morphin, codein or other narcotic will be required to stop pain and cause rest if ergot is coincidently given. If the blood pressure is low, this is another indication for the administration of ergot. Generally, if the blood pressure is high, ergot should not be given.

Local applications of cold and ice to the head (the hair being cut short) and to the spine, may inhibit the inflammation, and sometimes seem to be of great value. At other times these cold applications increase the pain. This is especially true if the temperature is low. Exactly what these cold applications do to the blood vessels of the parts inflamed is a question that has not been determined. Cold sponging of the body is hardly advisable, as it tends to increase the internal congestion. Theoretically, it would seem more sensible, and practically it is often better to use

hot applications, as hot sponging, and even hot baths have been advised for very young children, to relieve the congestion of the central nervous system.

Painful joints may be wrapped in cotton and kept warm, much as is done in rheumatism. Conjunctivitis should be treated with a boric acid wash. The throat and nose should be cleansed with saline sprays or mild antiseptic gargles.

There would seem to be no excuse for the administration of quinin, strychnin, caffein, or any other cerebral stimulant. It would also seem inadvisable to administer alcohol in any form. If the blood pressure is high, hot sponging, small doses of nitroglycerin and more brisk catharsis are indicated.

The patient should remain in bed for at least a week after the cessation of the fever, and convalescence should be slow, and the return to activity should be delayed. During convalescence it is well to administer small doses of sodium iodid, as iodine seems to be efficient in aiding the absorption of exudates. Iron and other tonics may be indicated.

Stiffening of the muscles and joints may require massage, and, if there are any adhesions in the joints, an orthopedist should be consulted as to whether passive movements or forcible breaking up of these adhesions under an anesthetic is advisable.

The frequency with which mental deterioration occurs can only be determined by a long, careful study of many cases. Cerebral degenerations and disturbances may develop after many years and yet apparently have been caused by this disease.

The various complications that may occur have already been mentioned, and their treatment would be that usual for the localized inflammation modified by the general condition of the patient from the cerebrospinal fever.

## ACUTE ANTERIOR POLIOMYELITIS

### DEFINITION

It would seem that Flexner's criticism of the long-used names for this disease is justified, because the infection may be present and yet there be no real inflammation of the cord justifying the names of

anterior poliomyelitis or infantile paralysis. However, whatever the name, it should be considered an infective, communicable disease that attacks the nose and throat, and causes the usual general symptoms of infection not unlike influenza; that it is likely to, but by no means always does, cause an inflammation of the central nervous system; and that it frequently, but by no means always, causes paralysis. When paralysis is caused, it is distinctive as being almost entirely a motor paralysis.

#### EPIDEMIOLOGY

Although this disease is distinctly epidemic, it more or less constantly occurs sporadically. It has occurred in this country in epidemic form for years, but has become more frequent since 1906, and many epidemics have been reported since that date. The largest and most fatal epidemic is the one of the summer of 1916, when 27,000 cases occurred in the United States, most of them in New York and the adjoining states.

Epidemic poliomyelitis seems to be self-limited, the disease dying out in a certain number of weeks. These epidemics occur most frequently in the warm months, June, July, August and September, but just what causes the disease to stop has not been determined. Although cold weather is not apparently conducive to the growth of the germ of the disease, still sporadic cases may occur in any month of the year. In New York City the epidemic of 1916 began in June, and practically ended in October. A winter epidemic recently occurred in West Virginia. There is no question that the spread of the disease is stopped by proper quarantine.

Children under five years of age are most susceptible to the disease, but no age is exempt. About 10 per cent. of a population is ordinarily composed of children under this age, but perhaps only an average of one in every hundred of these children acquire the disease in any one epidemic. In other words, a large number of all children, as well as most adults, are immune, or are not susceptible to this germ.

In the 1916 epidemic in New York City 1.6 persons in every thousand of the population were attacked, as against 2.4 in the rural districts; and in New York



City 80 per cent. of those attacked were under five years of age. (Matthias Nicoll, Jr., *Amer. Jour. Dis. Child.*, Aug., 1917, p. 69).

Just what predisposes to a new epidemic cannot be determined. The disease is always sporadically with us. The germs of other epidemic diseases may predispose to the development of this disease.

Unhygienic surroundings do not precipitate or promote this infection. The most perfectly housed and cared for child may acquire the disease, while the most neglected, ill-conditioned and unwholesomely housed child may escape it.

#### FATALITY

The disease is most fatal in young infants, and is more fatal to boys than to girls. Epidemics show an average of a 10 per cent. death rate, but the New York City epidemic of 1916 had a death rate of 27.2 in every 100 cases, i. e., more than one-fourth of the patients died. Paralysis of the respiratory muscles or of the respiratory center is the most common cause of death.

#### CONTAGION

It seems to be proved beyond question that the disease is transmitted by direct or indirect contact, and principally by contamination with the infected secretions of the nose, mouth, and throat. Whether infection occurs by direct transmission of the infected mucus by kissing, or by eating or drinking out of common receptacles, or by inhaling droplets which have been coughed or sneezed into the atmosphere around a patient, or by inhaling infected dust, the fact remains that it is transmitted from person to person. While the virus of the infection has been found in the feces, it is not known that it can long live in this environment. Secretions from inflamed eyes and ears of these patients may transmit the disease.

Though the feet of flies or their mouths may carry the infection and plant it where contact can occur, neither they nor any other insect have been shown to harbor this infection or to transmit it to man. No domestic animal has been shown to have or to suffer



from this disease, although the paralytic symptoms of the distemper of dogs and horses have suggested the possibility of a relationship.

To eradicate the disease, isolation, screening, and strict quarantine of the patient are absolutely essential. The nurse must sterilize all clothing and utensils used by the patient. All nose, throat, and bronchial secretions should be caught on gauze, if possible, and burned. Feces and urine should be collected in antiseptic solutions, or the diapers should be boiled. The nurse should not come in close contact with others, especially children, and should not prepare food for anyone other than herself and the patient. Though she may be immune, she may be a carrier; and we must recognize that this germ may be carried, as well as is the diphtheria germ, although the carrier may not have had the disease as far as is known.

In all epidemics a large number of unrecognized and "missed" cases undoubtedly occur, and account in part for the spread of the disease.

Probably the most active period for infection to occur is during the first week of the disease, but just how many days longer a patient could give the disease is not known; a quarantine of three weeks would seem to be protective to the community. A child or youth known to have been exposed to poliomyelitis should be isolated and under suspicion for two weeks.

The incubation is from three or four days to two weeks; perhaps it is generally about one week. How long a carrier continues to be a carrier is not positively known. Swedish observers have championed the view that chronic carriage of the virus of poliomyelitis is common. However, painstaking critical and experimental studies by Flexner and Amoss of the Rockefeller Institute are not in accord with this conclusion. Their deductions are to the effect that the virus is regularly present in the nasopharynx in cases of poliomyelitis in the first days of illness, and especially in fatal cases; that it diminishes relatively quickly as the disease progresses, except in rare instances; and that it is unusual for a carrier state to be developed. Hence the period of greatest infectivity of patients would appear to be early in the disease, which is probably the time at which communication of the virus from person

to person takes place. Therefore, preventive measures should unquestionably be centered on the actual patients and particularly early in the disease. How frequently a cured patient becomes a carrier is not known. Theoretically a patient cured of an acute attack of this disease has developed enough antibodies to overcome the infective agent in the nose and throat as well as in the cerebrospinal canal.

The germ or virus is not killed by ordinary drying; hence dust may carry this potent poison.

The majority of adults and most children over ten years of age, and a goodly number under ten years of age, are immune to this disease. How generally this immunity is natural or inborn, and how often such immunity has been acquired by abortive, undiagnosed attacks of this disease, cannot be determined. Recovered patients and inoculated and recovered monkeys have in their blood antibodies against this infection. The blood serum of normal adults shows such antibodies, though not of equal amount or of equal effectiveness to the blood serum of one who has had the disease, even many years before.

#### THE ETIOLOGIC ORGANISM OF POLIOMYELITIS

An interesting contention has arisen regarding the organism of poliomyelitis. In 1913, Flexner and Noguchi reported the finding of a micro-organism which they described under the term "globoid bodies" and which they stated seemed to bear an etiologic relationship to the disease. More recently, in connection with the epidemic of 1916, Mathers, Nuzum and Herzog, and Rosenow, Towne and Wheeler described an organism or organisms of a coccal nature and submitted evidence to show an etiologic relationship to poliomyelitis. The publication of this work apparently prompted Amoss of the Rockefeller Institute to extend that on the globoid bodies. He points out, moreover, that the globoid bodies have been made to fulfil Koch's law. It should be pointed out here that the coccus which has been mentioned, when grown in the media in which the globoid bodies are grown, assumes globoid forms; like the infectious material in poliomyelitic virus, it is filterable and resists the action

of glycerin. Bull, another worker in the Rockefeller Institute, insists that the organism reported by Mathers, Rosenow, Towne and Wheeler, and by Nuzum and Herzog is a streptococcus. He points out that the findings of these authors conflict in several respects with those of previous investigators in this country and abroad, all of which tend to exclude bacteria as the inciting agents of epidemic poliomyelitis.

Rosenow and Towne conclude from their most recent studies that the small globoid micro-organism which Flexner, Noguchi and their co-workers have considered to be the cause of experimental poliomyelitis has always, in their experience, been the result of the breaking down of large diplococci, which have been isolated from the central nervous tissues of each monkey infected with experimental poliomyelitis. These organisms have not been isolated from other tissues except lymph glands of poliomyelitic monkeys, nor from any tissue of normal monkeys. The mechanism by which the large forms become small has been demonstrated.

Obviously the subject demands further investigation and confirmation. Certainly, if the work of Rosenow and Towne is confirmed, the differences in the assertions of the various experimenters will be quite satisfactorily explained. The fact remains that a very interesting coccus has been found in the brain and spinal cord in patients that have died from poliomyelitis, but its relation to the disease is not yet determined. It may be a secondary invader or it may have a larger and more direct significance. In any event its discovery appears to be a distinct contribution to the bacteriology of the disease or diseases which have been called poliomyelitis.

#### CEREBROSPINAL FLUID

The cerebrospinal fluid shows early in this disease an increase in the number of cells, from 30 to several hundred per cubic millimeter. Eighty per cent. or more are mononuclears. The globulin content is increased, and the presence of dextrose is demonstrated by the reduction of Fehling's solution. Mild and even abortive cases may show the same spinal

fluid changes. "The blood in the pre-paralytic stage does not show a total leucocytic count in excess of what might be considered normal, but as the infection progresses, there is a constant and marked leucocytosis, with an increase of 10 to 15 per cent. of polymorphnuclears, and a decrease of 15 to 20 per cent. of lymphocytes." Meningism, syphilis and either tuberculosis or purulent meningitis may be confused with the early stages of poliomyelitis.

That the virus of poliomyelitis travels along the nerve trunks as does the virus of hydrophobia, is the generally accepted view, and seems to be proved by experiment.

#### EARLY SYMPTOMS

The onset of the disease is usually sudden, without prodromal symptoms, with a more or less sharp rise of fever. The fever may or may not become high, but the pulse and respirations are likely to be much increased. Another constant symptom is pain, more especially in the head and back of the neck, and there may be pain on movement of any part of the body. There is especially likely to be pain down the spine and in the legs; there may be some stiffening of the spine and the back of the neck. While the patient may be drowsy, the brain is likely to be clear. Instead of drowsiness the patient may be irritable. The pharynx is generally red, and the tonsils are red. There may be spots or even membrane on the tonsils. The eyes may be congested.

These symptoms occurring during an epidemic of poliomyelitis should cause this disease to be suspected, and spinal puncture should be made for a positive diagnosis.

Though most patients are constipated, there may be diarrhea, and there may be vomiting. Gastrointestinal symptoms occurring in an epidemic of poliomyelitis, with an unusual amount of muscle, back, and head pains, should also cause a suspicion of this disease, and spinal puncture should be made.

In many instances, the fever of the first day or two is followed by a remission, and then a second attack of fever, and later paralysis; or paralysis may occur on the first day, depending upon the amount of



cerebrospinal inflammation. An older patient may complain of dizziness. There may be diminished patellar reflexes, although they are likely to be at first increased. There may be bladder paresis and retention. There may be all kinds of hyperesthesia and vasomotor disturbances, as flushing and blanching of the skin of different parts of the body. Herpetic eruptions are not infrequent. Kernig's sign is often present. Profuse sweating may occur, and there may be eruptions on the skin of varying types, mostly erythematous. These vasomotor disturbances may also occur in the mucous membranes of the nose and throat, causing them to appear pale.

The fever usually lasts only a few days, but it may persist for even as much as two weeks. There seems to be no characteristic range of temperature in this disease. The intensity of the beginning symptoms seems to be no indication of future severity or of future paralysis. On the other hand, an attack with mild early symptoms may be followed by serious paralysis and a dangerous condition.

Not only is flexion of the head sometimes combated by the patient on account of the pain, but also flexion of the spine often causes pain, a symptom of diagnostic importance.

#### DIAGNOSIS

The most frequent early symptoms above described, especially if an epidemic is in progress, should suggest the possibility of poliomyelitis. If there is stiffening of the back of the neck and pain on bending the spine, the presumptive diagnosis is poliomyelitis, and should lead to immediate lumbar puncture for a positive diagnosis. Careful examination of the extremities may show, even in a young child, a slight difference in the movement of the arms or legs, and such beginning paralysis may occur early in the disease. A diagnosis should, of course, be immediately clinched by lumbar puncture. However, it should be noted that many patients with this infection do not show paralysis, and may not show muscular weakness, and may not show stiffening of the muscles, early in the disease. Also, the temperature may drop in a day or two, to rise again later. Consequently it should



be urged that a patient with the symptoms described, during an epidemic of poliomyelitis, even without positive diagnostic symptoms, should either have lumbar puncture made to clear up the diagnosis or should be under suspicion for a week or ten days. If poliomyelitis is suspected, though the symptoms are indefinite and lumbar puncture is not allowed, the patient should be isolated for two weeks.

It may be briefly noted that cerebrospinal fever is similar in the beginning to poliomyelitis, with perhaps more tendency to vomiting, and with generally an eruption. There is more stiffening of the neck and less pain, early, in the lower back and legs. Tuberculosis meningitis is never as rapid in its onset as either of the above infections.

#### LUMBAR PUNCTURE

When lumbar puncture is made for diagnostic purposes it should be remembered that normal spinal fluid contains not more than 10 cells per cubic millimeter, and in poliomyelitis the number is increased to 20, and at times to even more than 100.

Rührah (*Amer. Jour. Med. Sci.*, Feb., 1917, p. 178) states that in the early stage of the disease the polymorphnuclear cells are found increased, while after paralysis has occurred the chief increase is in the lymphocytes. He states that this increase in the number of cells in the spinal fluid disappears in about two weeks.

If the fluid withdrawn is clear, the mononuclear cells will predominate; if it is opalescent, as it occasionally is, the polymorphnuclear cells are increased.

Of course if there is an increase of fluid in the cerebrospinal canal there is increased pressure, and the amount of pressure is indicated by the speed with which the fluid is discharged at the time of puncture. The quantity of fluid obtained varies from 10 to 50 c.c.

Pain in the majority of cases is relieved by lumbar puncture. Also many head symptoms are relieved by the evacuation of the fluid which is under pressure. Consequently, lumbar puncture is a therapeutic measure of distinct value.

Charles Dana (*Jour. A. M. A.*, April 7, 1917, p. 1017) describes a condition that not infrequently occurs, namely, what may be termed "puncture headache." This rarely begins until the day after the fluid has been removed from the spinal canal. It is not serious, and does not last long, but may be quite severe. The pain is diffused over the head and even over the eyebrows, or it may be mostly occipital. Dana finds this pain, with various remissions, may last five to ten days, or even longer. He also finds it is more likely to occur when there is a small amount of fluid in the spinal canal, and hence low pressure, than when there is high pressure, with extra fluid in the canal. This, of course, is logical, especially as he interprets the condition to be due to the fluid removed from the spinal canal, allowing the water pad of the brain to be diminished so that the brain temporarily rests on the cranial bones and thus causes this headache. Therefore to prevent this "puncture headache" he would withdraw the fluid very slowly, and keep the patient horizontal for three or more days.

Zingher (*Jour. A. M. A.*, Mar. 17, 1917, p. 817) states that "the injection of immune or normal human serum into the spinal canal during the acute febrile stage of poliomyelitis causes a distinct cellular reaction which is mostly polynuclear in type." He believes these polynuclear cells have a phagocytic action.

#### PARALYSIS

As previously stated, when flexing the head and bending the body—in other words, when movements of the spine and consequent irritation of the spinal cord—cause pain, poliomyelitis is frequently the cause. However, without these symptoms paralysis may develop at any time, from even twelve hours to many days, and Rührhah states that paralysis may occur as late as twelve days after the beginning of the disease.

It should again be emphasized that the severity of the beginning symptoms seems to bear no relation to the amount of paralysis that may follow; severe onsets may not be followed by paralysis; mild onsets may be followed by multiple paralysis and death. Severe

abdominal pain may occur, even simulating conditions that call for operation. There may be tremblings or tremors of one or more extremities, especially on the attempt to move these parts.

The most frequent parts paralyzed are the legs, either one or both. LeBoutillier (*Amer. Jour. Med. Sci.*, Feb., 1917, p. 188) states that in 25 per cent. of all cases one or both legs are involved, in 12 per cent. one or both arms. In the severest cases the muscles of the trunk are involved, even those of the neck, and death occurs from failure of respiration. The most frequent muscles paralyzed, in the order of their frequency, according to Ebright (*Jour. A. M. A.*, Sept. 1, 1917, p. 694), are the "anterior foot muscles, quadriceps, glutei, hamstrings, deltoids, hip flexors, internal rotators of the thigh, and external rotators of the shoulder." He also declares that "a stretched muscle will not regain its tone."

It has even been suggested that most cases of scoliosis are due to frank or undiagnosed poliomyelitis.

Some statistics from the New York epidemic showed that two-thirds of the cases had paralysis that lasted longer than the quarantine, while about 15 per cent. never had paralysis, and about 15 per cent. more had short-lived paralysis.

#### EARLY TREATMENT

The early treatment should take into consideration the prevention of the infection of others, even on a doubtful diagnosis, i. e., before the diagnosis has been positively made. In other words, a suspected patient should be isolated, the room screened, all discharges disinfected, and all clothing sterilized. Of course as soon as the diagnosis is made the case should be reported, and all children who have been in contact with the patient should be isolated for two weeks.

It should be recognized that the nurse or other attendants may carry the infection in their nostrils or throats and yet not suffer from the disease. They may have become immune from previous attacks, or they may have a natural immunity, and still harbor the infection. The dust of a room in which a patient

with the disease has been may carry the infection, and it is even stated that the streets and sidewalks may harbor it; hence the spread of epidemics. Bathing in pools of water, or in tanks where the water is not frequently changed should be prohibited during an epidemic. While domestic animals have not been shown to harbor the infection, pet animals, as cats and dogs, might carry the infection in their fur.

As peroxid of hydrogen, even in weak solutions, kills this virus, it should be used in 5 per cent. solution in warm water as a spray (two or three times a day) into the nostrils of all children who may have been exposed to the disease. Also the nostrils of the attendants of the patients should be so treated. The throats of young children should be sprayed, while older children should gargle, a little stronger solution of peroxid of hydrogen, as 10 or 15 per cent. In three or four minutes after the peroxid of hydrogen solution has been used the parts should be sprayed or washed with a weak (not more than 1 per cent.) solution of sodium chlorid and sodium bicarbonate in warm water.

The treatment of the preparalytic stage is the same as that of any other infection. The bowels should be thoroughly cleaned out with the purgative which seems most advisable. Food should be entirely stopped for twenty-four hours, and only water given, or at least only some simple cereal gruel, or milk. The patient should be absolutely at rest, with no mental or physical disturbance. The body should be gently cleansed with hot or warm water sponging, the temperature depending on the amount of the fever. Cold water sponging is inadvisable. If there is much pain the patient should be very gently handled, to cause the child the least possible muscle movement, and it may even be necessary, temporarily, to abandon sponging.

Acute pain must be stopped with small doses of codein or of the deodorated tincture of opium. The beginning dose may be small; the frequency should be sufficient to render the child nearly free from pain and to cause some sleep. The lumbar puncture that should be done for diagnostic purposes often becomes a therapeutic measure of value, relieving the symptoms of pressure and relieving pain. Puncture for



therapeutic purposes may be done every day for several days, and may even be done more frequently, if symptoms of pressure are present.

By the second or third day the nutrition of the patient should be carefully watched; the character and the amount of the food depend upon the height of the temperature and upon the ability of the stomach to digest. Some nutrition every three hours in the daytime and once or twice in the night is the best method. If it is not advisable to give meat broths or meat extracts, the child should receive small doses of iron almost from the beginning of the illness. One of the best methods of administering iron is a powdered tablet of the saccharated oxid of iron (*Eisenzucker*), and a 3-grain tablet once a day is sufficient.

If there is much restlessness and sleeplessness without acute pain, small doses of bromid may quiet the child, stop the pain and cause sleep. Coal-tar products and synthetic drugs, although they are more or less analgesic, should not be given these young children. Their depressant action is uncertain. Even salol is probably inadvisable. Although iodid of potassium has been recommended, there seems to be no excuse for it, except possibly in very small doses. Iodid of potassium has never been shown to cause absorption of exudate in acute conditions. A very small dose of iodid, whether as iodin, or as iodid of potassium or sodium, as a stimulant to the thyroid will be no more necessary in this infection than in any other infection. On the other hand, it may be advisable in all infections, as it is now known that the thyroid gland is always disturbed by every infection and its detoxicant action in disturbed nitrogen metabolism is increased by a sufficiency of iodin.

Acute pain and active symptoms may disappear in from a few days to two weeks after the paralysis. Until pain has ceased, all active measures aimed at the paralysis are contraindicated. The treatment of the paralyzed parts should be to put them in the most comfortable position possible by cushions, sandbags or branbags, so that stretching of paralyzed muscles and ligaments may, if possible, not occur, and that overaction of nonparalyzed muscles may be limited.



Sometimes muscle spasm with pain is relieved by a warm water bag. Very hot water bags should not be used on the child's skin unless they are so covered that the heat is modified. Painful joints may be wrapped in cotton.

Hexamethylenamin has been suggested; but it has not been shown that this drug has any germicidal or antiseptic activity unless it meets acid media, as typically in kidney and bladder conditions.

As soon as convalescence is established, the nutrition should be of the best. Fresh air is important, but rest and quiet for the patient should be continued. Small doses of iron should be given, and some little bitter tonic may be administered, if the appetite is poor. Small doses of sodium iodid may be advisable, not more than 0.10 gram ( $1\frac{1}{2}$  grains) twice a day. Calcium in some form may be advisable, unless considerable milk is given the patient.

#### SERUM TREATMENT

As it was found laboratorily and clinically by Flexner and others that the injection of a serum from a person who had had poliomyelitis was more or less inhibitive to the advance of this disease and seemed to stimulate the production of antibodies in the individual to fight the disease, it seems advisable to obtain such blood serum, if possible, and to inject it, best intraspinally, and possibly later intravenously, into the afflicted patient. It is found to be more valuable when given in the early stages, as is true in the antitoxic treatment of all diseases. The serum should generally be given intraspinally, and perhaps only intravaneously when there are signs of a general infection or complications have occurred. It may be given daily, or every two or three days for several doses, and the amount suggested has been from 5 to 30 c.c.

The pressur  under which the fluid is given should be very carefully watched, and if pressure symptoms occur, the injection should immediately cease, and if necessary some of the fluid must be allowed to flow

out of the canal. It may be administered at the time that for therapeutic or diagnostic reasons the fluid of the spinal canal has been withdrawn.

On account of disturbing symptoms and the danger of increased pressure, Draper (*Jour. A. M. A.*, April 21, 1917, p. 1153) cautions that not more than 10 c.c. should be injected into the spinal canal, and then only when a larger amount of spinal fluid has been removed. In other words, increased pressure in the spinal canal must be avoided. He, however, believes that immune serum, when it can be obtained, should be given every child, and the earlier the better, as it seems to have been shown to be of the greatest value before paralysis has occurred. Still, until we have more positive data, during the progress of the disease, even if paralysis has occurred, the serum should be given, as it may cause improvement.

It is hardly necessary to urge the necessity of a careful selection of the donor for this serum. The more recently he has recovered from poliomyelitis, the more active in antibodies must his serum be. However, he may have had the disease many years before and the serum still be of value as a therapeutic agent. Of course he should have no chronic disease. Syphilis must be excluded by a Wassermann or Noguchi test, unless the history of the patient and his family is absolutely known. The laboratory care and preparation of the serum for use is beyond the province of this review. Also the value or necessity of preservatives need not be discussed.

#### SPECIFIC HORSE SERUMS

Recent reports by Rosenow and by Nuzum and Willy on the treatment of epidemic poliomyelitis describe the preparation of a serum of immunized horses, for which excellent results are claimed. The horses were immunized with the coccus found in the central nervous system in epidemic poliomyelitis, and consequently the question of the exact relation of this coccus to poliomyelitis is again raised. In both reports it is asserted that the serum used has protective and curative powers with respect to the experimental poliomyelitis of the monkey produced by means of

poliomyelitis virus, that is, suspensions in physiologic sodium chlorid solution of fresh or glycerinated nervous tissue from human beings that have died with this disease, or from monkeys experimentally infected. While the coccus with which the horses were injected unquestionably occurs in poliomyelitis, and frequently may be present in the so-called virus, its exact relations to the disease have not been made fully clear because thus far it has not been possible to produce poliomyelitis in the monkey by injections of this coccus in undoubted pure culture. But in spite of the lack of this essential link in the chain of evidence necessary to establish that the coccus is the cause of the disease, it must be acknowledged that if the serum of horses immunized with the coccus protects against and even cures poliomyelitis in the monkey, an adequate experimental basis for a thorough trial of such serum in the treatment of the human disease certainly has been provided. It is clear, however, that the results of further experiments on the action of the serum in monkey poliomyelitis are required before the claims in favor of its protective and curative powers may be regarded as fully established.

In conclusion, it may be said that the injection of horse serum appears to be quite harmless in poliomyelitis; that the authors of the reports are deeply impressed with the apparent good effects of the serum; that their figures appear to show a great reduction in the death rate, but that the figures are probably not to be accepted without the reservation that they may seem more favorable than is actually warranted. The suggestion may be ventured that even if it eventually should be found that serum produced as described in these reports has little or no specific effect on the essential cause of poliomyelitis, its use may be followed by favorable results due on the one hand to general nonspecific effects such as follow the intravenous injections of foreign proteins, and on the other hand to its action, specific in nature, on the coccus used in the immunization, which may be a secondary invader of no little importance in poliomyelitis.

## COMPLICATIONS

These hardly need discussion, as each part affected must be treated in the best way possible, as it would be treated were this disease not its cause. A lung complication is very serious, as the danger is very great from anything that interferes with the respiration. If the muscles of respiration are more or less paralyzed, inhalations of oxygen, or artificial respiration, may be tried, but they are probably not often, if ever, life-saving.

Secretions and exudates from any complicating inflammation should be thoroughly sterilized, as they may carry the germ or virus of infection.

## CONVALESCENCE

There is a difference of opinion as to whether a paralyzed patient should be long kept at rest in bed or should be allowed soon to begin to walk. There can be no doubt that anything that tends to fatigue is seriously injurious to the paralyzed muscles, and, also, anything that causes overactivity of the non-paralyzed muscles is not desired.

It would seem, therefore, that each patient should be individualized as to the length of time he should remain flat in bed, with such passive movements and such gentle massage as seems advisable. As soon as improvement occurs the patient should probably begin to be about, with such protective apparatus as will prevent deformities and still allow locomotion, and at the same time be not so massive and weighty as to cause much fatigue.

From the start, voluntary movements of paralyzed limbs and groups of muscles should be urged, and even after long months, and even years, of paralysis such voluntary attempts should be made, sometimes resulting in wonderful improvement. Resistant massage, if the child is old enough to cooperate, is advisable, but the results must be carefully watched and tire prevented.

Gentle faradism and gentle galvanism, of just sufficient strength to cause contraction of the muscles, is probably soon advisable; but electricity should not be used more than from 5 to 10 minutes in any one day.



Some clinicians believe electricity is of no value (especially Lovett, *Jour. A. M. A.*, Aug. 5, 1916, p. 421), but the majority of opinion is that, when properly used, it is of value in awakening the activity of muscles and nerves. However, artificial contractions are never of as much value as are even slight voluntary contractions.

Before electricity is applied the part should be heated with warm applications and gentle massage, as the circulation is always sluggish in a paralyzed part and the part is always colder than normal parts of the body. This massage, by stimulating the circulation of both blood and lymphatics, allows the electrical reaction to occur with less strength of current. Electric light heat, as suggested by Lovett, is a valuable method of heating a chilled, paralyzed limb.

It has been suggested that strychnin be injected into a paralyzed muscle during the convalescent stage, and the dose given has been quite large for a child. This may be tried where a muscle or muscle group is not awakened by ordinary means. One-sixtieth of a grain may be given a child five or more years old, and even larger doses have been given.

Lovett, who has studied this disease very thoroughly and written many articles embodying his observations, states that it is not generally recognized that the muscles of the back and abdomen become weakened in this disease, causing many deformities, especially if the child too long sits. Deformities in these cases should be prevented by proper jackets or corsets.

Skilled muscle training and the advice of an orthopedic surgeon is essential in the management of these paralyzed children, even in the convalescent stage. Drop foot, or eversion, or inversion must be, if possible, prevented. Rotation or deformity of the knees must be noted and prevented, if possible. A group of muscles may not be actually paralyzed, but exercise with these muscles may show an unusual tire of one leg as compared with the other, or one arm as compared with the other, and such an extremity needs watchful care and treatment.

Finally, in this stage of convalescence it should be urged that all massage, applications of electricity, and



exercise should be done by skilled hands and with skilled advice. Also, the paralyzed limbs, and perhaps the whole body, should be kept extra warm by proper clothing, depending upon the age of the patient, the season of the year, and the climate. Chilled limbs do not recover as do limbs that are kept thoroughly warmed.

#### PROGNOSIS

The early prognosis as to fatality should be very carefully made, even in mild cases, up to the latter part of the first week. The actual death rate varies greatly in different epidemics, perhaps roughly from 10 to 20 per cent., or even higher.

While a few patients have no paralysis, many of these will be found to have weakening of some muscles. Such weakening of muscles and actual paralysis may rapidly recover, even in a few days, but most paralyzed patients will not recover for several weeks or even months, while perhaps the majority of those who have suffered paralysis will never again have perfect muscle power. Some patients may recover without scientific orthopedic or other medical treatment, but the possibility of such recoveries without deformity should not be depended upon. There can be no question that scientific, careful management of the paralyzed patient and of each paralyzed limb may cause progressive and continued improvement for months and even years, while any mismanagement, as overexertion, fatigue, or misdirected and overused measures for improvement will certainly retard recovery or even prevent it.

As previously stated, respiratory paralysis is a most common cause of death, and oxygen inhalations, artificial respiration and other artificial respiratory methods may prolong and possibly save life. It has been suggested that turning the patient from side to side may prevent dangerous edema in the vital nervous tissues.

It should be remembered that in apparent improvement in this disease serious relapses may occur. When the disease attacks an adult it seems to be more serious, and the prognosis not so good.

## LATE TREATMENT

Orthopedic advice should be sought early in the disease, as soon as paralysis occurs, or at least the best orthopedic measures should be taken to prevent deformities. During the stage of convalescence is the period when the orthopedist should either take charge of the patient or should be frequently enough consulted to insure the best possible management of the paralyzed child. The great necessity for rest and yet graded stimulation of weakened muscles has already been emphasized. Proper care at this stage prevents deformities that must be corrected surgically later. It cannot be too often repeated that voluntary effort is of the greatest possible value in awakening paralyzed muscles and groups of muscles.

It has been shown that a muscle that is too long over stretched by a malposition of a limb or part of a limb cannot recover its vitality and strength. Hence such stretched muscles must be relaxed by proper splints or appliances. Although, as previously stated, electrical stimulation is not considered of value by some clinicians, it is urged by others that if a muscle responds to gentle faradism, such gentle daily treatments continued but a few minutes at a time will hasten recovery of the muscle.

Lovett (*Jour. A. M. A.*, April 7, 1917, p. 1018) says that improvement may go on for two years, and even if a muscle shows but a slight trace of power there is still hope, even after several years of paralysis. He emphasizes the danger from unnecessary braces, and the danger from not properly supporting the paralyzed muscles. He especially urges that support be given to weak abdominal and weak back muscles. In other words, it requires the best of judgment to decide just what sort of spinal, or other supports, should be used.

If a deformity persists after two years or more, surgical orthopedic measures may be instituted, such as the cutting of tendons or fasciae, the stretching of muscles; or more radical measures may be instituted in the way of bone and nerve surgery.

When a brace is placed on a child, the mother should thoroughly understand that this is only a pre-

vention of deformity, it is not a cure for the paralysis, and the child should either be treated at home or taken to some institution for continued muscle treatment. Such treatment may be artificial heat, as by electric light; massage; electricity; voluntary or resistant exercise; and, later, graded exercises sometimes termed educational exercises, to re-educate a muscle or group of muscles to do its or their proper work. Heat and warmth to a paralyzed limb are constantly essential, as the nutrition of the whole part, muscles and nerves, improves under normal temperature, while, on the other hand, nutrition is at a minimum when the part remains far below normal in temperature as compared with other parts of the body.

In a communication by Lovett (*Jour. A. M. A.*, July 21, 1917, p. 168) he states that it is a serious matter for a child to attempt to walk on a paralyzed leg before the end of the first year. He finds when the child walks too soon that many times a change from a partial to a total paralysis in the foot muscles occurs. He also notes that a paralyzed right hand recovers sooner than a paralyzed left hand.

## TYPHOID FEVER

### GENERAL PROPHYLAXIS OF TYPHOID FEVER

Typhoid fever is one of the most preventable of all infectious diseases. The essential agent in the causation of typhoid fever, *Bacillus typhosus*, has been found in the blood, in the feces, in the urine, and in the bile. It cannot always be discovered in the early days of the disease, but in the second or third week it can generally be detected. It may persist for years, even as many as twenty-five or fifty, after a patient has become convalescent, and also in the body, particularly in the feces and urine of persons who have never themselves, so far as can be determined, suffered from an attack of the disease. These persons are known as "typhoid carriers."

After diagnosing the disease as typhoid, the physician should at once report the case to the health office. Even should the case be suspicious only of typhoid, the following precautions may well be taken. The feces immediately on being passed should be covered

with a 5 per cent. solution of phenol, and the hard masses should be broken up so that the disinfectant will thoroughly penetrate the fecal matter and come in contact with all microorganisms which may exist therein. Other disinfectants may be used, such as chlorinated lime, or liquor cresolis compound, 2 per cent. The utmost cleanliness should be used by the attendants in connection with the movements of the bowels. The skin surrounding the anus should be carefully washed with a disinfectant solution, and the cloths used for this purpose should be put in paper bags and subsequently burned. The attendant also should, after bathing the patient, always wash her hands in a disinfectant solution. In a similar manner the urine should be discharged into a vessel and mixed with a disinfectant solution.

The bacilli can sometimes be found in the sputum, and if the patient has any cough, the sputum should be collected on cloths and burned.

All bedding should be soaked in a disinfectant solution and boiled before being washed. The cups, glasses, dishes, knives, forks, spoons, and napkins used by the patient should also be disinfected before being washed.

During convalescence, the feces and the urine should be subject at intervals to bacteriologic examination, to determine whether the bacilli are still present. It has been found that they may be absent at one time, and may reappear later, so that repeated examinations are necessary. The patient should be carefully isolated until repeated examinations have shown entire absence of bacilli, both from the feces and the urine. When these rules have been observed in the care of any patient suffering from typhoid, he, his friends, and the physician, will rest assured that there will be very little likelihood of his communicating the disease to anyone else directly or indirectly.

As has been stated, the disease may be carried directly from the patient suffering from the disease, or from a so-called bacillus-carrier. The bacilli may be received directly by a person who does not possess immunity to the disease by handling articles, such as clothing or utensils used in eating, which have been

contaminated by fecal matter, urine, or sputum from a typhoid patient. A far more common mode of infection is the indirect method, which embraces infection through water and through various food supplies, especially milk and oysters. Many epidemics have been due to the infection of a water-supply from patients suffering with typhoid.

Jordan (*Jour. A. M. A.*, June 6, 1914, p. 1772) states the following rules, for the individual and the community in preventing typhoid:

#### RULES FOR PREVENTING TYPHOID FEVER

##### *For the Individual:*

1. Keep away from all known or suspected cases of typhoid.
2. Wash hands thoroughly before meals. Do not use "roller towels."
3. Use drinking-water only from sources known to be pure, or if this is not possible, use water that has been purified by municipal filtration or by hypochlorite treatment or by boiling in the household.
4. Avoid bathing in polluted water.
5. Use pasteurized or boiled, instead of raw, milk.
6. Select and clean vegetables and berries, that are to be eaten raw, with the greatest care.
7. Avoid eating "fat" raw oysters and, in general, oysters and other shell-fish whose origin is not known.
8. Be vaccinated against typhoid in all cases in which any special exposure is known or feared.

##### *For the Community:*

1. Insist on the hearty cooperation of all persons with an efficient health officer.
2. Require notification and a reasonable degree of isolation of every known or suspected typhoid case.
3. Exercise strict control over the disinfection of known typhoid excreta.
4. Insist on pure or purified water-supplies.
5. Require pasteurization of milk-supplies.
6. Regard all human excreta as possibly dangerous, and control their disposition in such a way as to prevent contamination of food or drink.



## VACCINATION AGAINST TYPHOID FEVER

The well informed physician needs no arguments to convince him of the efficacy of antityphoid vaccination or that it is a desirable procedure. The universal adoption of this method of protection by every one of the armies involved in the great war, the very low typhoid rates prevailing among the troops of the various countries, the mildness of the disease which attacked the soldiers when they succumbed to the overwhelming doses of typhoid bacilli prevalent under the filthy conditions in the trenches in which they perforce must live—all this is sufficient evidence to convince even the most sceptical that antityphoid vaccination actually protects.

Occasional cases of typhoid did occur among those vaccinated against the disease. These cases have been explained on the ground that the immunity created is not permanent and that it may be insufficient to combat tremendous doses of organisms taken directly into the body on the drinking of badly polluted water. The fact that a few cases did occur among immunized men should not deter the physician from the belief that the vaccine yields protection.

The incubation period of typhoid fever is about two weeks. Its duration, when there are no relapses, is about two months. This means two weeks of incubation, four weeks of more or less serious illness, and two weeks before the real convalescence. Young adults and youth are most likely to contract this disease, although it may occur at any age. This is the age, then, for the greatest effort to be made to give protective inoculations. All nurses and members of hospital staffs; students of colleges and seminaries; employees, and those who are interned in work houses, jails, prisons and asylums; men in lumber camps; and all those who travel and are therefore subjected to varying water, milk and food-supplies, such as "traveling" men, engineers, seamen, tourists, and vacationists, should receive typhoid preventive vaccination.

With all the advantages to an individual and to a community conferred by protection against typhoid fever by vaccination, the physician must also carefully

consider what constitute contra-indications. It seems to be wise carefully to examine every individual to ascertain his condition of health before vaccination is done. It should not be done if he is suffering from any acute infection however simple, namely, a coryza, a pharyngitis, a tonsillitis, or any acute gastro-intestinal disturbance, gonorrhea, syphilis, albuminuria, glycosuria, or the more serious conditions of chronic nephritis or diabetes. The injections should be made in the afternoon, and the active symptoms will generally be gone by noon of the next day. Three injections should be given at weekly intervals.

The method of injection is as follows: Paint with tincture of iodine an area about 15 mm. in diameter at the insertion of the deltoid muscle. Inject subcutaneously with sterile needles and the best vaccine the dose of killed bacteria decided on. Then paint the region with collodion and allow it to dry. If proper care is taken, no infection will occur, and, as above stated, a temperature reaction is rarely above 100 F., and perhaps never reaches as much as 102 F., even in exceptional instances. A severe reaction could only occur when there is some serious complication in the individual, as perhaps tuberculosis. All slight reactions are generally over in twelve hours and even severe ones are generally over in twenty-four hours.

The local reaction is greatest after the first dose, less after the second, and least after the third. Typically, there is an acutely inflamed area, varying in size, not hard and indurated like an incipient abscess. The arm may ache, and the axillary glands may become tender. The local reaction is generally at its height in about ten hours, and generally nearly gone in twenty-four hours. Any more severe reaction would be due to contamination.

The dosage for children should be based on the child's weight and not on its age. The recommended adult dose is based on a weight of 150 pounds. It seems to be necessary for continued protection to revaccinate children more frequently than adults, namely, in about three years.

Various preparations are now available. In the vaccination of our troops over one million men were

injected with a triple vaccine consisting of 1000 million typhoid bacilli and 750 million each paratyphoid A and B bacilli per cubic centimeter. The first dose is 0.5 c.c. and the second and third doses each 1 c.c. Inoculations are made subcutaneously at intervals of seven days.

#### LIPOVACCINES

Many troops of the United States were vaccinated with a vaccine of typhoid and the two paratyphoid bacilli prepared in an oily medium—so-called lipovaccines. On the basis of experimental work, it was believed that vaccines so prepared would permit the giving of the vaccine dosage by a single injection, thus avoiding the delay incident to the giving of the three separate injections with the saline vaccine. It was also believed that a vaccine so prepared yielded an immunity of greater duration. Although final and exact figures are not available, it is understood that results with these vaccines were disappointing in that the protective value does not appear in actual practice to be as great as that yielded by the saline vaccines. The general subject will be discussed in the later article on vaccine therapy.

#### TREATMENT OF TYPHOID FEVER

*A. General Measures.*—Needless to state, the patient with typhoid fever should be put to bed and kept quiet. The usual measures, such as the use of a cleansing cathartic, should be instituted and simple fluid mixtures such as lemonade or citrate solution may be given. Patients should be encouraged to change the position in bed sufficiently often to prevent the occurrence of congestion of any of the viscera and the development of bed-sores. The hygiene of the mouth should be watched, as mentioned for other diseases, with scrupulous care.

*B. Diet.*—Whether we have underfed our typhoid patients or overfed them, it seems that the evidence is very strong that milk alone is not the proper food for these patients. In fact, when we consider the frequent difficulty in its digestion, the large amount of it that must be given to satisfy the system either in calories or in protein, it would seem that we should rule against it as a typhoid diet. These facts imme-

diately cause the decision that our old feeding of typhoid fever was wrong, and that we must select a new or modified food in this disease.

It can not be questioned that the high temperature, rapid pulse, delirium, and that association of nervous symptoms called typhoid are not caused by the typhoid germ alone, but by a double infection, and the double or secondary infection is due to toxins or the products of secondary germs absorbed from the intestines.

Tympanites is an indication not of typhoid fever, but of intestinal putrefaction and fermentation, and a mistake in the management of the bowels and of the food administered.

It stands to reason, then, that primarily such food and arrangement of the movements of the bowels as cause the least tympanites and the least indigestion are of first importance in the management of typhoid fever. Secondly, the food which, so far as possible, satisfies the requirements of the body for nutrition and at the same time satisfies the above requirements of easy and thorough digestion, should be the food of choice.

A liberal amount of fat in the diet will send the calories up, but not all patients bear fat well, especially early in the disease. Fat may be tried in the form of cream, of butter and of yolk of egg. Coleman has been able to give as much as 200 or 250 gm. of fat per day without causing digestive disturbances. The fat content of ordinary milk is of course considerable, and milk in amounts of from 1.5 to 2 liters per day can be given to most patients without difficulty.

Fruit juices, to which lactose has been added, may be given, as long as there is no diarrhea, but they should be discontinued should diarrhea develop. It must be remembered, however, that patients on a high-calory diet ordinarily have from two to four stools a day.

It should be continually borne in mind that individual patients may not thrive under a high-calory diet. Should tympanites or other digestive disturbances begin to appear, it is well to modify the diet at once and especially to restrict the intake of milk and of lactose. If, on the high-calory diet, examina-



tion of the stools shows that undigested food is passing through, the diet should be reduced.

A good mixed diet for twenty-four hours, suitable for an ordinary adult ill with typhoid fever, is represented by one pint of milk; two eggs, or the whites of three eggs; one cup of thoroughly cooked, thin oatmeal gruel; the juice expressed from a pound of chopped round steak; a small cup of coffee, in the morning; a small portion of orange or lemon jelly made from gelatin; and enough salt and sugar in the above to make them palatable.

The milk may be administered, hot or cold, with or without salt, with or without Vichy, with or without lime water, in two or three doses, as deemed best in the individual instance. Sometimes koumys makes a valuable substitute for ordinary milk. Sometimes buttermilk may be used, and this in large quantities.

The eggs may be given raw, beat up with a little milk, or given with lemon juice on cracked ice, may be poached, or, if the temperature is not high, soft boiled or in the form of boiled custard.

The oatmeal gruel should generally be made with milk, and thoroughly cooked, strained, and salted to suit the taste.

Meat juice is best prepared by just covering the chopped steak with water, and allowing it to stand for an hour and a half. The water and juices are then expressed out of the meat. This watery extract will then contain, besides the blood of the meat, actual muscle serum, which is a decided tonic, especially to the heart. This expressed fluid is then kept on the ice and administered, properly salted, in two or three doses. If the patient is not too ill, the food may be made more agreeable by allowing the patient to chew broiled steak, but not to swallow the fibrous portion.

While gelatin is generally pleasant to most patients, it also has some nutritive value, and possibly tends to aid normal coagulation of the blood, and perhaps prevents capillary bleedings from the inflamed intestines.

A patient who is accustomed to his morning coffee need not be deprived of that pleasure because he has typhoid fever, unless there are meningeal symptoms, or meningitis is actually present.



Experience seems to teach that it is best to administer nutriment to the typhoid patient in small amounts at three-hour intervals. It should, however, be arranged that the patient has normal rest. In other words, he should not be awakened from a comfortable sleep because it is time to do something to him or for him, and at regular three-hour feeding intervals should be the periods at which he is to be disturbed for other treatments. During the night, if he is not seriously ill, he should not be disturbed as often as every three hours.

With the treatment outlined and, with proper care of the mouth, the patient's tongue is rarely badly coated and generally moist, and there should be no nausea or tympanites.

*C. Colon Enemas.*—It has been lately shown that fecal deposits, seeds or other food debris may become lodged in the lower corner of the ascending colon, the cecum, and may cause inflammation or symptoms of appendicitis, and may even be a subsequent cause of appendicitis. Hence it may be found to be good treatment, in the first few days of typhoid fever, to give colon enemas of from one to two quarts of warm water, the patient lying on his right side, to aid in washing away the possible accumulations in the cecal region. Such colon washings can certainly do no harm in the first days of typhoid, and may be of marked benefit in the future course of the disease. In other words, the more thoroughly the pathologic process in the intestines, in typhoid fever, is considered from a surgical standpoint, with the aim to keep these ulcers and the inflamed intestinal mucosa as clean as possible, the less will there be secondary infection, the less will there be tympanites, the less will there be deep ulcerations, hemorrhages and perforations, the less high the fever, and the better the whole prognosis.

*D. The Fever.*—Hydrotherapeutic measures have become so universal in the treatment of the fever in typhoid patients that it is unnecessary to describe these measures in detail.

*E. Medical Treatment.*—Not only should the bowels be cleared at first, but subsequently the bowels should be moved daily. This is best done by administering

every other day some gently acting saline laxative, which cleans the upper part of the intestines, tends to drain the portal circulation, to keep the liver, our Pasteur filter, in a healthy condition, and to cause an easy watery movement. Any tendency to a diarrheal condition or to too many movements from such a laxative may be stopped by the administration of 1/10 grain of morphin. The bowels are thus cleaned and subsequent excessive peristalsis inhibited, and the patient is generally at rest for the remainder of the day. On the alternate day a small glycerin enema, administered with a glass syringe, consisting of a tablespoonful of glycerin and a tablespoonful of water, will cause within ten minutes a movement of the bowels that will at least empty the descending colon and cause the expulsion of gas. Such management of the bowels seems contra-indicated only by intestinal hemorrhage, signs of perforation and great prostration. Such treatment also prevents secondary infections that keep the temperature high. In other words, if the patient's bowels have moved daily artificially, and the movements are not caused by diarrhea due to irritation from the disease, tympanites is not present and less antipyretic measures are needed.

The best antiseptic to the upper part of the intestines seems to be salicylic acid in some form, and one of the best forms is the combination with phenol, viz., phenyl salicylate (salol), which may be given in capsules without any disturbance of the stomach, as it is there undissolved and breaks up in the duodenum. A small dose of this drug (0.25 gram or 4 grains) every six hours may be given continuously through the disease, unless there is a diminished excretion of urine, or albuminuria develops, or the urine shows darkening from the phenol, which would be very rare from this sized dose. Even the non-believers in bowel antiseptics must admit that whether the colon bacilli or typhoid bacilli come to the upper part of the intestine by migration, or reach these regions through the blood stream, it would not be so healthy for them provided salicylic acid was present in the upper intestine as though it were not present.

Thus far sour milk treatments, lactic acid germs and the administration of yeast have not been mentioned. Certainly bowel infections of most kinds are made better by the administration of yeast. The value of sour milk treatments in typhoid fever must be determined by experience. A patient, however, who is not doing well on the diet above suggested should be put on the sour milk treatment. One of the principle objections to such treatment is that the patient's stomach soon objects to any one diet that is to be long continued, although for a few days he might accept the soured milk. On the other hand, most patients do not object to the sour drink produced by the solution of a five-eighths inch cube of a compressed yeast cake in a glass of water, given two or three times a day.

*F. Vaccine Therapy.*—It is difficult to arrive at a just estimate of the value of vaccines in the treatment of typhoid fever, because the evidence for and against their use is derived from two widely different sources. From a theoretical standpoint, such a procedure has little justification. It is well known that there is an extensive invasion of the blood by the infecting organism early in the course of the disease, and it seems reasonable to assume that these invading organisms furnish sufficient antigen stimulus to cause the maximum antibody formation. On the other hand, if this antibody formation is delayed early in the course of the infection, vaccines may be of value in stimulating such a response. In the field of clinical medicine, many observers have reported striking results from the use of vaccines, and it is the common opinion of these clinicians that they are efficacious in the treatment of typhoid fever.

The type and dosage of the vaccine have had no apparent influence on the results obtained. Sensitized vaccines have been strongly advocated by Besredka, Metchnikoff, Garbat and others, and on theoretical grounds such vaccines would be favored; but the majority of investigators have had good results with suspensions of dead bacteria prepared according to Wright's method.

Although autogenous vaccines generally have been preferred, stock vaccines prepared from organisms

selected for their high agglutinogenic power have been efficacious in the hands of many. Reports have been so uniformly favorable with all preparations, that it seems as if the type used is of secondary importance.

*G. Convalescence.*—The patient should be kept in bed until the pulse regains its normal rapidity, the blood pressure is not too low, and the amount of exercise that he is allowed to take should not be such as will much increase the action of the heart beyond the normal rate. The patient should first be allowed to sit up in bed. If this results in a marked increase in the heart rate, he should not be allowed to get up. It is also important that the nervous system should not be subjected to unusual irritation, and he should avoid cares and worries as far as possible. Any anemia should be treated as mentioned in connection with other infectious diseases. Protracted rest and a simple diet are essential features of this protective treatment.

Before releasing the patient from observation the stools and urine should be examined repeatedly for the presence of typhoid bacilli.

### TYPHUS FEVER

The recent developments in our knowledge of the etiology and transmission of this disease have been largely due to American investigations. These advances have resulted from the clinical observations of Brill and the experimental work of several scientists, notably Ricketts, Anderson and Goldberger.

Typhus fever is of microbic origin, but the infective agent has not yet been determined with certainty. Studies by Plotz indicate that it is a minute bacillus, and while these studies have been generally accepted some European observers (Nicolle) are still inclined to doubt that the organism he describes is the one which causes the typhus which they have observed. While the etiology of the disease has just been determined, its mode of transmission has been worked out so that we are able to take reasonably efficient means for its prevention. It has been well demonstrated that the disease is communicated by the body louse and probably also by the head louse. This observation explains many puzzling features, for



example, as McCrae remarks, the decrease of the danger of infection when the patient was removed to a hospital and the great danger to attendants in epidemics, to which Murchison drew attention.

The transmission of the disease to monkeys has enabled it to be made the subject of exact experimental work. Typhus fever formerly was very prevalent in epidemics, and also as sporadic cases, being known under the names of jail fever, camp fever, ship fever, etc., terms which indicate its close association with overcrowding and filth. With the progress of sanitary science, the prevalence of the disease decreased until it appeared to have vanished with the march of civilization, especially in this country.

In the United States the disease, in its typical form, has been found usually in ships coming into our seaports. A mild form of the disease has been discovered even in our farthest inland cities. It is important that the existence of this mild form should be borne in mind not only as explaining many puzzling cases but also as the possible source of epidemics when the organism may assume unusual virulence or the opportunity for transmission be unusually great.

The epidemic form, according to Brill, usually begins rather suddenly with a chill or chilly sensations, though it may occasionally be preceded by two or three days of malaise and general body pains. Headache rapidly supervenes and fever immediately appears. These symptoms are quickly augmented, so that by the second or third day the fever may have reached 104 or 105 F. As the disease progresses it is marked by profound toxemia, signs of intense blood infection, marked involvement of the nervous system manifested by delirium, excitement and tremor, and somnolence, stupor, coma vigil, and an unusually severe involvement of the muscular system as well, with the tremor and physical exhaustion which were so often manifested.

Epidemic typhus fever is a disease of the winter months and is highly communicable. The endemic or mild form of typhus fever and the epidemic typhus fever are alike in their onset, in the first stage of the



eruption, in the critical decline and both are terminated, not followed, by relapses. In all other respects they differ. The eruption in the mild form (Brill's disease) rarely goes to the hemorrhagic stage; it is always an erythema. There is no profound involvement of the nervous system; there may be a slight delirium, but it is mild in type, appearing only at night. The patient is never, or rarely, stuporous, never seized by maniacal excitement, never goes into coma vigil, and has no muscular tremors, subsultus, or carphology. Involuntary discharge of urine and feces are not seen in the mild form of typhus fever. In the mild form the headache, instead of diminishing about the eighth day as in the epidemic form of the disease, becomes progressively more intense even up to the end of the illness. The mortality of the mild form is less than 0.25 per cent.

The prevention of the spread of this disease is a comparatively simple problem, although, as experience in the present war shows, it may be very difficult of accomplishment. It consists essentially in the destruction of vermin. This involves, of course, at the same time the removal of filth, the cleaning of the inhabitants, and the prevention of accumulation of waste. The treatment should be symptomatic following the suggestions made for other infections.

#### INFLUENZA: GRIP

During the latter part of 1918, extending into 1919, and again in the early weeks of 1920, a pandemic of influenza and influenzal pneumonia appeared all over the world and caused as great a mortality as any other epidemic in the world's history. Probably more articles appeared in the literature on this subject than on any other subject which concerned the medical profession during that time. It would be impossible, and in fact, undesirable to review here all this literature or even to consider the articles dealing with treatment. Suffice to say that there is no good evidence that any treatment other than that purely symptomatic had any specific virtues in controlling the disease.

## ETIOLOGY

The organism described by Pfeiffer in 1891 has long been known as the influenza bacillus and good observers have found it constantly present in cases of this disease. On the other hand, there has never been convincing evidence of its relation to influenza, for it is frequently found in many other diseases as well as in normal throats. It should also be borne in mind that there are a number of organisms varying greatly in pathogenicity, which are grouped under the name of Pfeiffer's bacillus. Many observers have claimed that the disease is due to a filterable virus and there is good evidence both for and against this claim. Mathers found a green producing streptococcus in many cases dying of this disease and other workers have been able to find it quite constantly present. In those cases with pneumonia—many observers have insisted that every case seen during the epidemic also showed pneumonia—all of the usual organisms invading the respiratory tract have been found including the various types of pneumococci, streptococci, Friedlander's pneumobacillus and even staphylococci. It is also pointed out that the pneumonia is not of the usual lobar type but a bronchopneumonia with no definite areas of consolidation, absence of the usual fibrinous pleural exudate, extreme wetness of the lung, and blood stained pleural fluid.

## PROPHYLACTIC VACCINATION

In the face of the tragic attack of this disease numerous workers prepared vaccines which it was hoped would have definite virtue in preventing the disease. Vaccines were made of single strains of Pfeiffer's bacillus, polyvalent vaccines of the same group, and all sorts of mixtures were made, based on the bacteriological findings in various communities. It may be unnecessary to say that the bacterial flora differed in various parts of the country and in different persons in various places. Most of the workers have been exceedingly optimistic concerning their results. On the whole, however, the concensus of the best opinion has been voiced by McCoy: "The general impression gained from uncontrolled use of vaccines

is that they are of value in the prevention of influenza; but, in every case in which vaccines have been tried under perfectly controlled conditions, they have failed to influence in a definite manner either the morbidity or the mortality."

#### GENERAL PROPHYLAXIS

During the time of epidemic health officers everywhere were alive to the condition and it is doubtful if any person in the United States was not to some extent reached by the literature and advice circulated. The measures in brief include: Staying away from crowds, isolation of the sick when feasible, avoidance of hand to mouth infection; the wearing of a suitable face mask by those in immediate attendance on the sick; plenty of sunlight and fresh air; the avoidance of dampness and undue exposure to rain, snow and the elements; early rest in bed in a warm room during the first signs of the disease. In addition the usual precautions attendant on acute infectious diseases should be employed.

#### SYMPTOMATOLOGY

It is doubtful whether any physician needs to have the symptoms described for him. The patient nowadays can almost make a diagnosis. The small blood vessels all over the body seem to dilate and produce capillary congestion, especially of the mucous membranes, the most frequent result being coryza, a pharyngitis, a laryngitis or a tracheitis. The congestion in the larynx causes the harsh, dry, metallic cough which is quite characteristic of this type of influenza. The congestion and swelling of the mucous membrane of the trachea causes a peculiar oppressed feeling with more or less pain, referred to the upper part of the sternum. The great amount of sneezing which occurs with a typical attack, almost similar to hay-fever, is due to congestion of the mucous membrane of the nostrils. The conjunctivae may also be injected, causing pain in the eyeballs and often a conjunctivitis, another typical symptom of influenza. In some seasons there seems to be a special tendency to middle-ear inflammations. At other times there frequently

occurs a congested drum, with sometimes a hemorrhagic bleb or vesicle on the drum, a very painful though easily remedied condition.

The almost constantly present lumbar backache at the onset of this disease is probably due to congestion of the kidneys, and albumin is frequently found in the urine of such patients, and occasionally blood corpuscles. A menorrhagia or a metrorrhagia may occur from the same tendency to dilatation of the blood-vessels. There may even be nosebleed, and occasionally a slight hemoptysis without any other assignable cause and without any subsequent development. With this disease, although the fever may be high, the skin is likely to be moist, and there may be a profuse perspiration. The pulse may be slower than we normally expect from the height of the fever, and the blood-pressure is generally lowered; all of these conditions are due to the tendency of the blood-vessels to dilate.

The heart is generally weak from start to finish in this disease, and even collapse turns can occur.

Rather an infrequent type of the disease is the bowel type; this can occur without respiratory catarrhal symptoms. Patients so affected have diarrhea, with more or less intestinal irritation, apparently the greatest amount of dilatation of blood-vessels in these cases occurring in mucous membrane of the intestinal tract. These various types, the catarrhal, the nervous and the abdominal, may be interwoven, and a patient may show symptoms of all three.

The future of every case of influenza is prostration, nervous and muscular debility, with more or less circulatory weakness; in other words, there is exhaustion. The patient's resisting power is reduced, and any defect or diseased condition that he may have is aggravated by an intoxication with this germ.

If no complications occur, the convalescent patient should rest as much as possible, should not be subjected to exposure and should be given tonics, and, if necessary to cause restful sleep, for a short period at least, some hypnotic or some physical method of causing sleep. The most frequent complication is pneumonia, and the type of pneumonia that the influenza germ seems to cause most frequently is the lobular or



bronchial pneumonic type; pneumonic congested areas may be found in different parts of one or both lungs. Not infrequently, however, true lobar pneumonia occurs.

The next most frequent complication, as suggested above, is the middle-ear inflammation. The various sinuses in the region of the nostrils may become affected; all types of indigestion may occur, and not only sleeplessness and meningismus, but also a very serious meningitis, and even insanity can be caused by these germs and their toxins. Mental depression is a common occurrence, following severe attacks of grip. Pericarditis and endocarditis occur as complications of influenza.

It is thus seen that this disease should always be taken seriously, and every possible means used to prevent contagion, as it is one of the most highly contagious diseases. It spreads with great rapidity, but only by contact, although it may doubtless be transmitted by infected clothing, and perhaps even by letters.

#### TREATMENT

It would appear that almost every drug or preparation in the Pharmacopeia has been recommended and tried in influenza and, indeed, a great many more that are not in any Pharmacopeia have also been strongly recommended and tried. Among those for which specific virtues have been strongly claimed are: intravenous injection of camphor oil, camphorated oil with guaiacol, intravenous use of mercuric chlorid, intravenous injections of hexamethylenamin, quinin by every route in large doses, colloidal gold, calcium chlorid, diphtheria antitoxin, and tetanus antitoxin. As suggested by Herrick, "someone has blundered in reaching conclusions."

It having been determined or suspected that a patient has influenza, it is much more important that he remain in bed, or at least in the house, than if he has an ordinary acute cold. Also, it is more essential that he be more or less isolated or that measures be taken that he does not spread the disease by spraying from coughing or sneezing, and that he does not use the same towels, napkins, drinking-cups and eating



utensils as other members of his family. The patient should be prohibited from fondling and kissing children. If the patient is a young child in close contact with the mother or nurse, all possible precautions to prevent contagion should be taken.

In a word, each family should be taught that grip is an infection, that it is contagious, that it spreads rapidly, that it may have serious complications and that it frequently leads to pneumonia, which has become in many regions of this country the most frequent cause of death. As previously stated, whether a schoolchild begins with an acute cold or an influenza, he should be sent home and remain there until he is well.

As a grip patient is liable to have a chill, or at least feel chilly or have cold sensations up and down the back, anything that makes him warm improves his condition. He may be given hot malted milk, hot tea or hot lemonade, at more or less frequent intervals, until his chilliness has ceased. The patient may be given a hot tub bath and then put into a warm bed in a warm room as an efficient means of making him comfortable and relieving his internal congestions. Hot water bags at the feet and extra coverings to the bed are often needed. A quickly acting stimulant is camphor, given in tablespoonful doses of the official water (*aqua camphorae*), in lemonade, every two or three hours. The various methods suggested for aborting an acute cold may be used in this disease. Much greater care must be exercised, however, if the patient has the influenza infection than if he has a simple cold, as to when he can return to his work or occupation, or be subjected to exposure to cold or dust, either in a house, building or outdoors.

Soon the temperature rises and often quite high, associated with severe headache, backache and irregular pains in other parts of the body. At this time a drug such as acetanilid, antipyrin, acetphenetidinum, or acetylsalicylic acid will be of benefit, provided that the patient is not ambulatory, and that he is not to be subjected to exposure. With this depressing infection such treatment is not wise unless a patient is in bed, or at least remains in the house.

The proper dosage of these drugs has already been suggested, and no one of them should be long continued. The most depressant is undoubtedly acetanilid, and perhaps the least depressant is acetphenetidinum. Should depression occur after one of these drugs has been administered or from the disease, circulatory stimulants such as camphor or caffein should be given and the patient surrounded with dry heat. A hypodermic injection of strychnin sulphate, 1/30 grain, may be given to stimulate the nerve centers. The following prescription is suggested:

	Gm.	
R Acetanilidi .....	0 25	gr. iv
Sodii bicarbonatis .....	1 0	gr. xv
M. et fac chartulas 10.		
Sig.: One powder, with water, every two hours.		

	Gm.	
R Acetphenetidini .....	1 50	
Phenylis salicylatis.....	1 50	āā gr. xxv
M. et fac chartulas 5.		
Sig.: One powder every three hours.		

A combination of aspirin, camphor and Dover's powder will sometimes be found of value:

	Gm. or C.c.	
R Ac. acetyl. salicylic.....	6	3 ii
Pulv. camphorae .....	1	gr. xv
Pulv. ipecac-et opii.....	4	3 iss
M. et fac chartulas 20.		
Sig.: One powder every three hours.		

Where there is much irritation of the throat, gargles of salt solution and mild alkaline solutions are advised.

When there is pain or headache suggesting involvement of the nasal sinuses, sprays containing epinephrin 1:10,000 will often give relief by allowing the escape of retained secretions.

But little food is needed during the first twenty-four hours of grip, and it should not be pushed even on the second day, if food is repugnant to the patient. He should have plenty of water and such simple liquid nourishment as he desires. As soon as the appetite returns, food should be pushed. The various catarrhal conditions should be treated as suggested under coryza, pharyngitis and bronchitis. Also, while the patient is

kept warm, he should have good fresh air in his room. This is essential with all infections, and especially with infections of the nose, throat and lungs. The bowels should be treated as indications call for. Simple laxatives may be given, if needed, or the soothing bismuth subcarbonate, if there is intestinal inflammation. Phenyl salicylate (salol) may be given, if there is much fermentation in the bowels, or the Bulgarian form of lactic acid bacilli may be given for a few days.

#### SERUM TREATMENT

In the midst of numerous deaths from this disease and the subsequent panic, physicians tried practically every form of biologic therapy thus far known. Among other things all of the various antipneumococcus serums, the antistreptococcus serums, the non-specific proteins, normal horse serum and convalescent serum were tried. The evidence thus far available is not convincing that any of these measures have proceeded farther than the experimental stage. Most rational, perhaps, is the use of convalescent serum under properly controlled conditions. The work of Hartman, McGuire and Redden in the U. S. Navy and of Stoll in the U. S. Army tends to show that, properly used, this treatment cannot do any great harm, and it was their belief that in a small percentage of cases at least it had beneficial effects.

#### USE OF DIGITALIS

Herrick has stated that in his experience the remedy of greatest value was digitalis. Without waiting for alarming indications of failing heart to develop in the way of feeble tones, rapid action, arrhythmia or dilatation, digitalis was given by the mouth, hypodermically or intravenously in small or large doses as the need arose. It may be stated incidentally that a good preparation of digitalis given by mouth should give definite action within four to six hours, making its intravenous use unnecessary.

#### CONVALESCENCE

As soon as the patient begins to convalesce, he should be given tonics and if there is no inflammation

in the ears, quinin is valuable. Some form of iron should generally be given, and possibly a bitter tonic before meals. If the patient is not nervous, a small dose of strychnin three times a day is good treatment. On the other hand, it should be urged that strychnin stimulation is overdone, and a patient who cannot sleep should not be given strychnin or quinin later than the noon meal.

#### CONCLUSION

The management of influenza should be as rational and simple as that of a case of typhoid fever. The use of drugs should be entirely symptomatic, and when they have served their purpose they should be discontinued. In the article on pneumonia which follows will be found further information as to the treatment of the pneumonia frequently seen following influenza.

#### PNEUMONIA

Pneumonia is today the most serious acute infectious disease confronting the physician. Second only to tuberculosis among the acute infectious diseases as a cause of death, it attacks suddenly and kills quickly.

Occurring usually in endemic form, it also appears frequently in epidemic form, and has become one of the most threatening of diseases.

#### DEFINITION

In outlining a plan of procedure to follow in the prophylaxis and treatment of pneumonia it is essential to have clearly in mind the causation and natural course of the disease. Pneumonia, or inflammation of the lungs, includes acute lobar pneumonia as well as various forms of atypical and bronchopneumonia.

#### THE INFECTING ORGANISM

Acute lobar pneumonia, due to infection by the pneumococcus, usually runs a rapid course, and is characterized by a diffuse exudative inflammation of large parts of one or more lobes of the lungs. Bronchopneumonia, on the contrary, may be due to a variety of bacteria, but is usually associated with

streptococci. Most cases of pneumonia which follow or complicate contagious diseases are due to streptococci, i. e., are septic pneumonias.

In pneumonia following influenza the clinical and pathologic picture is that of a streptococcus bacteremia with metastases in the lungs, joints, kidneys, serous surfaces, gallbladder and appendix. The prominent gross pathologic lesions are extensive hemopurulent pleuritis and pericarditis, marked hyperplasia of the lymph glands, parenchymatous degeneration of kidneys, liver and myocardium. The lungs are usually only partially consolidated, very heavy and pliable. Often most of an entire lung may be involved. These cases correspond to those often observed in association with diphtheria, scarlet fever, measles, etc. The cases of pneumonia which occurred so extensively in connection with epidemics of measles in our training camps were in large part of this sort.

While we have been in the habit of saying that lobar pneumonia is caused by the pneumococcus, recent studies have shown that strains of pneumococci which are alike so far as cultural properties are concerned are still widely separated in their biologic qualities.

When the study of pneumonia at the Hospital of the Rockefeller Institute was undertaken, a large number of races of pneumococci were isolated and studied as to their immune reactions. Animals were immunized to each strain, and the blood serum of each immune animal was then tested as to its power to agglutinate each of the strains and also as to its power to protect mice from infection by each strain. As a result of these studies the strains of pneumococci grouped themselves into four classes or types. The serum produced by immunizing with each member of a group acted in a similar manner on all the strains of the group, agglutinating the bacteria and protecting mice against infection. On the contrary the serum produced by immunizing with a member of one group had no such power over the strains of the other groups. The four groups of pneumococci are spoken of as Types I, II, III and IV. Type I is found in 33 per cent. of cases of lobar pneumonia; Type II in



29 per cent.; Type III in 13 per cent., and Type IV in 20 per cent. The pneumococci found in normal mouths belong to Type IV.

These studies have a very important bearing on the prophylaxis and specific treatment of lobar pneumonia. Making use of the serum of animals which have been immunized against cultures of the four types of pneumococci, it is possible to test the strain from each case of pneumonia and to place it under the type whose corresponding serum causes it to be agglutinated. This is very important if immune serum is to be used, as the only cases of pneumonia which are benefited by serum are caused by organisms of Type I.

In 448 cases studied in the Hospital of the Rockefeller Institute, 145 were of Type I, 148 of Type II, 55 of Type III and 100 of Type IV. Of these cases, pneumococci were found in the blood in 136 instances. The mortality when the organism was found in the blood was 55.8 per cent., whereas in the 312 cases with negative blood cultures, the mortality was only 8.3 per cent. This shows that the presence of the pneumococcus in the blood during lobar pneumonia indicates a severe infection and a bad prognosis.

In the pneumonias accompanying influenza in the great epidemics of 1918-1920 a varied bacteriology was found. Prominent organisms in addition to the various strains of pneumococci and streptococci were a green producing streptococcus isolated by Mathers whose finding was later confirmed by a number of other observers, the Pfeiffer bacillus and some of the ordinary cocci of the staphylococcus type. It seems doubtful that the exact etiology has been determined and bacteriologists are inclined to the view that these cases are probably due to an infection with a minute filterable organism and that the bacteria which have been found are secondary invaders producing definite symptoms and complications.

#### GENERAL CONSIDERATIONS

Although pneumonia has been considered a self-limited disease tending to recovery, this can hardly be said to be generally true. The sthenic type of pneumonia which does tend to recovery, with one or

more lobes distinctly involved, is now not so frequent as a less circumscribed pneumonia, or an asthenic type with a low temperature and without much tendency to self-limitation and, as the statistics show, not a great tendency to recovery. The crisis which should introduce recovery means, according to Hektoen, the destruction of the pneumococci in the lungs and blood. This, he says, is accomplished by phagocytosis and by extracellular digestive processes. Therefore, the greatest defense against pneumonia is a production of leukocytosis and of antibodies in the blood. Such patients as rapidly die of a toxemia have this blood defense in insufficient amount. When this defensive process has been produced in sufficient amount rapidly to destroy the pneumococci, the recovery is by crisis; when it is in sufficient amount to destroy them only slowly, the recovery is by lysis. The latter form of recovery is the one that we now see most frequently.

#### PREVENTION

It has generally been considered that many persons harbor the pneumococcus in the mouth and throat, and that it is thus ever ready to attack the person who becomes debilitated, and especially to add its attack to that of the influenza bacillus or to follow a streptococcal infection of the throat or nose. There is no doubt that exposure and a weakening of individual resistance play a prominent part in the development of the disease. Recent studies of the incidence of the various types of pneumococci in the throats of normal persons, in the throats of those suffering with pneumonia, in healthy persons in contact with cases of pneumonia, as compared with those not in contact, and in the dust of rooms in which lobar pneumonia had not occurred, as compared with the dust of rooms in which cases of pneumonia had occurred, all show that pneumonia, in a considerable proportion of cases at least, arises chiefly by infection from without. It was shown definitely that pneumococci of Types I and II are practically never found except in the environment of persons ill of the disease or in the environment of carriers.

It seems advisable, therefore, henceforth to regard every case of pneumonia as a focus for the spread of

the infection, and the same measures of prevention of infection of others should be instituted as have been found efficacious in other communicable diseases. These include primarily (*a*) isolation of the patient as far as possible, (*b*) collection of the sputum in special containers and its disinfection, and (*c*) sterilization and prevention of contamination from utensils, bed-clothing, personal clothing, handkerchiefs, and other material in close contact with the patient.

The physicians, orderlies or nurses in attendance on patients with pneumonia should practice the greatest care in order to avoid transmitting the disease to others. This involves the wearing of a clean gown when attending patients, the thorough cleansing of the hands by soap and water before and after attending each patient, and, as has been suggested by Weaver, the wearing of a simple protective face mask when in attendance on patients. This not only prevents the physician or other attendant from becoming infected, but also prevents the patients from becoming infected through their attendants with secondary infections with organisms which they do not already have.

The room in which the pneumonia patient lies should be kept as clean as possible, and after the patient's recovery it should be thoroughly aired, washed and sunned to dispose of any remaining organisms.

Cases of the common contagious diseases, as measles and scarlet fever, in which secondary pneumonia occurs should be isolated and not allowed with uncomplicated cases.

#### CARRIERS

Finally, a search should be made for pneumococcus carriers of the organisms of Types I and II especially, and these carriers should be instructed as to the prevention of the spread of the organisms. They may also be provided with a disinfecting mouth wash or gargle, and should use it persistently until the organisms have disappeared from the nose, throat and bronchial secretions.

Kolmer and Steinfield refer to the studies of numerous observers who have shown the high pneumococcal activity of ethylhydrocuprein hydrochlorid and of quinin preparations. They studied the possibility

of disinfecting the sputum and the mouth with such preparations. The results indicated that 1:10,000 dilutions of ethylhydrocuprein hydrochlorid or quinin bisulphate, in a 1:10 dilution of liquor thymolis constitute mixtures that may readily be used as mouth washes or gargles. Such a gargle may be used at least twice daily by those in contact with pneumonia cases, as well as by persons with pneumonia. Similar dilutions in Dobell's solution may be used for spraying the nose. For washing the mouth and gargling, a solution is conveniently prepared after the following formula:

	Gm. or C.c.
R Ethylhydrocuprein hydrochlorid or quinin	
bissulphate .....	102
Liquor thymolis .....	20
Distilled water to make .....	200

Liquor thymolis, which is used in the Philadelphia Polyclinic Hospital as a substitute for liquor antisepticus, is prepared after the following formula: benzoic acid, 64 grains; boric acid, 128 grains; thymol and menthol, each, 16 grains; oil of eucalyptus, oil of wintergreen and oil monarda, each, 4 drops; alcohol and glycerin, each, 4 ounces; water sufficient for 16 ounces.

#### PROPHYLACTIC VACCINATION

Vaccination against pneumonia with vaccines prepared from various organisms in saline suspensions as well as in oil—lipovaccines—has been given extensive and thorough trial. The evidence thus far available is quite conflicting and has been the cause of much acrimonious discussion. Early reports from military investigators were somewhat favorable, but these have been succeeded by denials of benefit. On the whole, it may be said that there is no evidence that prophylactic vaccinations against pneumonia even approximate in value the vaccinations against typhoid fever. The patient who is vaccinated should be informed that the protection is doubtful and that the vaccination is actually of the nature of an experiment. Polyvalent vaccines of pneumococci and all sorts of mixtures are available through commercial houses. The physician cannot protect against all the possible strains to which the patient may be exposed. It is doubtful whether protection is actually conferred against any.



## TREATMENT

1. *Rest.*—The patient's rest should be as near perfect as possible. Not only should the room be situated for the best possible fresh air, but it also should be as quiet as possible. It is often desirable that such patients receive hospital care and attention. If transfer to a hospital is to be made, the patient should not be allowed to stand, but should be moved with the least possible exertion to himself. Friends and relatives should not disturb the patient. Sleep and a quiet heart are more essential in pneumonia than in almost any other disease. Perfect rest does not mean that the patient should not be turned frequently, or that he should not have at times several pillows. It should be emphasized that the circulation in the lungs should be changed by alterations in position. A patient with pneumonia should not lie flat all the time. Hypostatic congestions readily occur with pneumonia, especially if the heart's action is impaired.

The daily sponging for cleanliness should be gentle, and cause the least possible disturbance.

2. *Fresh Air.*—It has now long been demonstrated that a pneumonia patient has less fever, a slower pulse, a better blood pressure, and breathes less frequently in cool, clean air than in close house air, and this whatever the season. Wards on the roof are very valuable for hospitals in the treatment of pneumonia as well as tuberculosis. The balcony, veranda, or even tent treatment of pneumonia is advisable at certain seasons of the year with certain types of patients, when such facilities are obtainable. It is always essential that the room of a pneumonia patient should have more than one window—the more the better—and that these windows should be open, except when the patient is being bathed or his clothing is being changed. Under no circumstances is it wise to have a draft of cool or damp air blowing directly over the patient's face, but screens can modify the direction of the wind or brisk air. Very young children and old persons should not be subjected to severe cold atmosphere, while older children and strong adults may not only endure cold, but may even thrive in it. The fresh air or outside air treatment of pneumonia is subject



to the modification of common sense. If a patient's body and extremities become cold or chilled when properly covered, the fresh air treatment is too severe.

3. *Diet.*—The food should represent something of all the elements required for nutrition. This means protein in the form of eggs, meat juices, properly made meat broths and milk. The eggs may be in any form desired, except fried. The milk should never be sufficient in amount to cause intestinal gas, or gastric indigestion.

The next necessary element for nutrition is starch, and it should not be forgotten that many a seriously ill patient may die of acidemia from carbohydrate starvation. Egg albumin and milk do not represent the proper food for patients more than a few days. The starches can be presented in cereal gruels, rice, oatmeal, malted milk, toast, crackers, and even by potato soup. Ice cream, custard, chocolate, and a small amount of sucrose or lactose are all of value.

The patient should be allowed plenty of water, as, however valuable a deprivation of water may be in aborting an acute cold or acute bronchitis, it is not advisable to withhold water in pneumonia. Unless there are edemas from a failing heart or from kidney insufficiency, water will increase the amount of urine and therefore remove more products of waste metabolism from the blood, thus tending to prevent the toxemia which is to be feared. Water promotes the secretion of the skin, which is desirable, and also renders the exudate in the lungs less tenacious and more easy of expectoration.

Elements of nutrition which must not be forgotten are: sodium chlorid, iron when meat juices are not given, and lime when little milk is given, and especially if there is much blood in the expectoration. The sodium chlorid can be given by properly salting the patient's food, especially his gruels, and even at times his milk. The iron may be given as a saccharated oxid of iron, 3-grain tablet, crushed at the time of taking, or crushed by the patient's teeth, and administered twice a day. The lime may be given as lime water in tablespoonful doses in milk or in water, three or four times in twenty-four hours; or it may be given in a capsule as calcium glycerophosphate, in 0.3 gm. doses.

The whole question of the diet is also subject to common-sense modification to fit the patient. There are enough suggestions in the foregoing to furnish sufficient nutrition while meeting almost any patient's desires. The main object is (1) to avoid depriving the patient of any element that he requires to promote metabolism and keep up nutrition, and (2) to avoid gastric and intestinal indigestion. If the tongue is heavily coated and the patient is so seriously ill that he does not digest properly, 5 drops of dilute hydrochloric acid in water, directly after his protein meals, will aid the stomach digestion and often clean the tongue. It may also stimulate intestinal digestion. If there is much intestinal gas, the diet should be closely studied to ascertain which food is causing it. Provided the blood pressure is not too high, the heart not too irritable, and the patient not too nervous and restless, coffee morning and noon, or coffee in the morning and tea at noon, or tea both times if the patient prefers, is advisable and often beneficial. Tea and coffee should be considered as representing caffein, and if the action of caffein is desirable, these beverages may be given. They should not be given in the late afternoon or evening, as they tend to prevent sleep.

4. *The Bowels*.—The bowels should move daily. Constipation should be prevented, but a diarrhea is not desirable. A cathartic may be given in the beginning of the disease, the one preferred by the physician. Later, his preferred laxative, whether a cascara mixture or some other combination, should be given. An occasional enema of glycerin and water, 1 ounce of each, will be found valuable. It will empty the colon and prevent the necessity of giving large doses of a laxative or a cathartic. Such treatment will aid in preventing tympanites.

Diarrhea will weaken the patient and add one more element to cause weakness of the heart. If it occurs, the bowels should be cleaned out with a laxative, castor oil if it can be taken, and then movements should be prevented by  $\frac{1}{10}$  grain of morphin. Saline cathartics are likely to increase the amount of gas in the intestine, and hence are generally contraindicated. Bismuth is likely to remain too long in the bowels and

promote the growth of germs and the absorption of toxins, which will add one more danger in the pneumonia toxemia that is constantly feared. Phenyl salicylate (salol) in 0.25 gm. doses, in capsules, may be given, four or five times in twenty-four hours, for a few days, to stop excessive fermentation.

5. *Abdominal Distention*.—The routine use of a daily morning enema of soap suds has been suggested to prevent this complication. If abdominal distention occurs, milk should be temporarily eliminated from the diet. A napkin or gauze soaked in olive oil, 3 parts, mixed with turpentine, 1 part, may be applied to the abdomen. These should be covered with flannels wrung out in hot water, the heat being retained by covering with a thick pad. The hot flannels must of course be renewed frequently, as needed. These may be continued until relief occurs. Following the application of the stupes, medicated enemas may be employed. The following is suggested:

Emulsion of	Oil of turpentine.....	10 c.c.
	Asafetida .....	30 c.c.
	Soap suds.....	1000 c.c. (one quart)

This is followed in an hour by an ordinary soap suds enema.

Frequently pituitary solution 1:10,000 in doses of 0.5 c.c. given hypodermically may be effective.

6. *Care of the Skin and Mouth*.—It is rare, with the proper diet, the proper treatment of the bowels, and with plenty of fresh air, that the temperature in pneumonia is so high as to require sponging. Even when the temperature is very high, with a cerebral complication, tepid sponging in a warm room is as severe treatment as should be tried. Ordinarily, then, sponging once or twice a day with hot water is advisable, both for the comfort of the patient and to remove perspiration and keep the skin active. The temperature is more or less reduced by the warm sponging, the blood vessels of the surface are slightly dilated, the circulation is equalized, and the normal activities of the skin, which are essential, are increased. Also, warm sponging tends to relieve the tension of blood in the head, and many times aids in promoting

sleep. If the patient's temperature is low, hot-water sponging is certainly advisable, and hot-water bags should be used around the extremities and even around the body. Profuse, cold, clammy perspiration should never be allowed to remain on the patient's body. Warm alcohol sponging in such conditions is advisable, that is, sponging with pure alcohol. A dash of alcohol in a basin of water has no therapeutic or physiologic value, and represents nothing but a fad.

Cleanliness of the mouth, teeth and tonsils is very important. The patient may have infected himself from his own tonsils or his own gums; such possibilities should be remembered, as well as the necessity of keeping the mouth as clean as possible during the illness.

The sputum, being as likely to communicate disease as is that from tuberculous patients, or even more so, should receive the same antiseptic care as does that of tuberculosis. The patient's mouth, excretions from the nose, and the nurse's hands and contaminated clothing or gauze should be treated in the manner so well understood in tuberculosis.

Vaccines have absolutely no place in the treatment of pneumonia for any specific virtues which they may possess. They have been given in large dosage so timed as to secure the nonspecific protein reaction and some observers have reported markedly favorable results. The method is a dangerous one and there is as yet insufficient evidence to warrant its general adoption.

#### SERUM TREATMENT

As has been stated, workers in the Rockefeller Institute have prepared antipneumococcus serums. The serums against infection with Type I organisms appear to have produced especially good results, and to be highly effective in the treatment of cases of pneumonia due to its type of organism. The serum of Type II is much less efficacious and, indeed, it has not yet been thoroughly demonstrated whether it has any valuable effect on the outcome of the disease. The serum for Type III organisms has apparently but slight therapeutic power, and has not been considered worthy of use in infections with this organism; the same is true



of infections with Type IV pneumococcus. Commercial preparations of these serums are available and also polyvalent serums. These polyvalent antipneumococcus serums are of extremely doubtful value. It has been suggested that polyvalent serum be given until the type of the organism is determined, and that following this, the specific serum for Type I or Type II may be utilized if the infection proves to be of that character. With pneumococci, at least as regards the first three types, the immunity reactions appear to be specific, and for this reason the workers in the Rockefeller Institute do not advise the routine manufacture of polyvalent antipneumococcic serums. In fact, they suggest that for the present, the production of antipneumococcic serum should be confined to Type I. The first thing is to determine the sort of bacterium causing the pneumonia in the individual, and if it is a pneumococcus to determine the type to which it belongs. If it is a Type I pneumococcus, serum treatment may be undertaken.

Before administering the serum, patients should be questioned as to previous injections of immune serums for diphtheria, meningitis or for tetanus infections, and also concerning previous symptoms suggesting asthma, hay-fever, or special sensitivity to proteins, including those in serum. It is well to try the intradermal skin test, injecting first 0.02 c.c. of sterile diluted horse serum, diluted with salt solution 1:10, with injection of a simple salt solution as a control, to learn whether or not the patient is especially sensitive to the serum. If sensitivity is present, the injection of the serum produces a large urticarial wheal surrounded by an area of erythema.

It becomes evident when one views critically the present status of the serum treatment of pneumonia, that it can be properly carried out only in institutions where it is possible to make accurate bacteriologic diagnoses and differentiations of the types of pneumococcus, and where facilities for the intravenous administration of large amounts of horse serum with safety are at hand. Even at best a limited number of cases are suitable for treatment with immune serum, a large proportion of lobar and the very large



group of atypical and bronchopneumonias not being susceptible of attack by these measures.

*Technic.*—The serum is injected into a convenient vein, usually at the bend of the elbow, the skin being previously cleaned with iodine and alcohol. If there are facilities for making blood cultures, blood may be first withdrawn for this purpose. The serum is injected into the vein with a syringe, or by the gravity method, the injection being done steadily and slowly, the injection of the first 10 to 15 c.c. occupying from ten to fifteen minutes. During this time the patient is carefully watched for symptoms of reaction, such as increased rapidity of the pulse, difficulty of respiration, cyanosis or urticaria. If no symptoms arise, the remainder of the injection may be completed in from ten to fifteen minutes.

*Dosage.*—The amount of serum necessary will vary in individual cases. It is generally believed that the initial dose should be large, perhaps from 90 to 100 c.c. of the standard serum. The specific serum treatment having been begun, it should be continued until a definite favorable result has been obtained, and the serum may be given every eight hours in doses of from 90 to 100 c.c., unless there are contrary indications.

The average total amount of serum required in cases in the hospital of the Rockefeller Institute was about 250 c.c. In many cases an elevation of temperature follows the injection of the serum within from twenty minutes to an hour, and this in turn is followed by a marked fall. If the temperature continues low and the patient's condition is good, no more serum is administered. The temperature is taken every two hours, and if it rises within twenty-four hours to 102 F. or over, a second dose of serum is at once administered. If no fall of temperature occurs following the first dose, or if it does not fall to 102 F. within eight hours, a second dose of serum may be given. The same rule governs the administration of the third or subsequent doses.

#### MEDICINAL TREATMENT

We are past the stage when any dogmatic advice can be given in regard to the use of drugs in pneu-

monia. The physician who has charge of a pneumonia patient must decide whether a drug is needed to combat a condition or symptom and which drug is the best for the object aimed at. The following are suggestions of drugs that have positive value for certain conditions, and brief descriptions of the pharmacologic action expected of them:

*Morphin or Codein.*—If the pain is acute in the beginning of pneumonia, one of these sedatives should be given. Acute pain is depressant and should not be allowed. Strapping of the chest is inadvisable in pneumonia. An ice bag over the painful region of the chest does not abort pneumonia and is generally not desirable, and on account of the generally high fever at this time, hot-water bags are not advisable.

A cough that is frequent and unproductive, as it may be in the first stage of pneumonia, will be quieted and the pain alleviated by codein sulphate in doses of 0.01 gm. ( $\frac{1}{6}$  grain) every two, three or four hours as is necessary.

*Acetanilid and Antipyrin.*—Acetanilid, 0.1 gm. (2 grains) every three hours for four or five doses, or antipyrin, 0.5 gm. ( $7\frac{1}{2}$  grains) every four hours for two or three doses, may be of advantage in lowering the high temperature in the first stage of this disease. These drugs also will lower the blood pressure and quiet the heart. Such an action may be needed in the very acute first stage of pneumonia, provided the heart is normal. At this stage the lowering of the blood pressure produced by these drugs is often beneficial. Later in the disease, even if there is high temperature, such coal-tar products are contra-indicated.

During the administration of the specific serum, drugs affecting the temperature should not be given, as the temperature is the best guide to the value of the serum, necessity for repeated dosage, etc.

*Ammonium Chlorid.*—If the expectoration is very adhesive and cohesive, scanty in amount and hard to raise, ammonium chlorid acts satisfactorily and is indicated. The dose should be 0.25 gm. every two hours, given in a sour mixture, or in lemonade; and if there is much pain or if there is ineffectiveness, frequent cough,

it may be combined with codein sulphate. Ammonium carbonate, besides being irritant and nauseating, has no tangible cardiac stimulant action; therefore it should not be used.

*Digitalis*.—If the patient does not die of the acute onslaught of the germ by incombatale toxemia, or by exhaustion from a later general toxemia, or from a migration of the pneumococci to the meninges, his survival or death depends on the ability of his heart to withstand the disease.

Porter, Newburgh and others have stated, on the other hand, that the heart muscle is not vitally injured in pneumonia. Respiration ordinarily fails before circulation. The heart in pneumonia may be influenced by digitalis in the same way as in normal persons, as shown by Cohn. The workers in the Rockefeller Institute suggest the use of some form of digitalis as a routine in these cases. Its use should be commenced early so that the patient is partially digitalized when necessity arises. Large doses of an active preparation are given. When digitalis effects appear, the drug is discontinued as long as the patient's condition indicates that its use is not necessary.

*Strophanthin*.—This drug, in recently made sterile ampules and injected directly into one of the veins in the elbow, provided digitalis has not been recently administered, is often efficient in tiding a patient over a shocked condition. It should rarely be repeated.

*Strychnin*.—This is a drug that has been very much overused. Clinically, strychnin often does very good work and even seems to tide our patients over critical periods. In a sluggish, inefficiently contracting heart, when digitalis is contraindicated, strychnin may be of benefit. The rule for strychnin should be, when indicated as shown by this discussion, to give to an adult not more than  $\frac{1}{30}$  grain, hypodermically, if deemed advisable, once in six hours, and such a dosage should not be long continued. As soon as there is improvement, it should be given by the mouth instead of hypodermically.

*Camphor*.—Laboratory findings and some hospital reports have not shown that camphor is of value in heart failure. On the other hand, clinical experience

at the bedside not infrequently shows that hypodermic or intramuscular injections of a sterile preparation of camphor and oil improves the pulse as to its regularity and volume, causes the surface of the body to be warmer, and often relieve a cardiac dyspnea by thus equalizing the circulation. When there is cardiac dyspnea, when the pulse is small, and especially when it is slow and weak and the surface of the body is cold, and when there is cold perspiration, that is, a partial collapsed condition, camphor given hypodermically every three or four hours may be of benefit.

*Caffein.*—The administration of this drug as coffee or tea has already been discussed under diet. Perhaps no drug, except epinephrin, the action of which is very fleeting, so frequently raises the blood pressure in serious conditions as does caffeine. In emergencies it may be administered hypodermically, or it may be given by the mouth several times in twenty-four hours. It should not be forgotten that it is a cerebral stimulant and not a sleep producer. Its action on the heart is almost always for good, except in some few patients who show an idiosyncrasy to it, the heart becoming irritable from any form of caffeine.

*Venesection.*—In some cases with the right heart distended with blood, venesection gives great relief.

*Nitroglycerin.*—When pneumonia occurs in a full-blooded, sturdy man, especially if he is of the age when his blood pressure is a little high, small doses of nitroglycerin, as  $\frac{1}{200}$  to  $\frac{1}{100}$  grain, every four to six hours, tends to dilate the peripheral vessels and relieve the internal congestion. It also slows and quiets the circulation. By bringing more blood to the surface of the body, it also tends to promote loss of heat and a reduction of temperature. It will never weaken the heart as long as the blood pressure is high; it should not be used if the blood pressure is low.

*Hypnotics.*—It is hardly necessary to name the different hypnotics. As stated above, in very weak conditions the only safe hypnotic is morphin. In delirium and in insomnia it may be well to use some other hypnotic than morphin. Almost any one of them causes some subsequent cardiac depression. The best hypnotic is perhaps chloral, although there is a prejudice



against its use. Probably an effective dose of chloral is no more depressant to the heart than is an effective dose of any other hypnotic.

*Quinin.*—Based on a large number of bacteriologic and immunologic studies of pneumonia and the reactions of the infecting organisms to various agents, Solis-Cohen has become convinced that the drug, quinin, plays a specific antagonistic rôle against them. It is employed, he says, not to reduce temperature but to combat bacteria and bacterial poisons. The reduction of the temperature which follows its use is used as a pharmacodynamic index. If the temperature is above 102 F. it is brought to or below that figure within three or four hours after the administration of quinin in sufficient quantity. A tendency to reascend is indication for more medication. By mouth he uses quinin dihydrobromid; intramuscularly, quinin and urea hydrochlorid, and intravenously, either of these or the dihydrochlorid. To begin with, 25 to 35 grains are given by mouth, and later, according to effect, 5 to 15 grains every two, three or four hours. Thus given, the temperature is kept down to 100 F. or below, careful watch being kept for symptoms of cinchonism. These are sweating, amblyopia or tinnitus aurium. Intramuscularly, 1 gram or 15 grains may be given and repeated every three or four hours. Intravenously, from 10 to 15 grains may be given in about 100 c.c. of physiologic sodium chlorid solution. While the drug is being given, solution of hypophysis may be used to sustain the blood pressure and prevent gastro-enteric paralysis. One c.c. of the posterior pituitary body extract may be injected every third hour until the systolic blood pressure in millimeters of mercury exceeds by 5 points or more the frequency of the pulse in beats per minute. It is continued as long as needed in order to maintain this relation.

#### CONCLUSION

There is no specific cure for most cases of pneumonia. The resources of the physician will be taxed and his judgment put to a severe test by many a case of this disease, but a successful outcome in many apparently hopeless cases will reward his efforts.



As stated at the outset, a restful, quiet room, a sensible, efficient nurse, a sufficient amount of fresh air, and a suitable diet and proper care of the bowels will prevent high temperature, heart failure, low blood pressure, insomnia, tympanites and toxemia in very many cases, and prevention is far better than the treatment of these serious conditions.

### RHEUMATISM

The term "rheumatism" is ordinarily applied to a group of symptoms chief of which is ill-defined pain in bones, muscles or joints. In a large series of cases studied by one author the etiology in individual cases varied greatly, some being due to syphilis, other to sciatica, neuritis, acute infections, tuberculosis and similar conditions. The patient with rheumatism usually presents a history of repeated attacks of acute or chronic tonsillitis or "sore throat." A thorough search will usually reveal one of these conditions or some other focus of infection in the body. Experimental work has shown and clinical experience has confirmed the relation of these foci to joint disturbances. Numerous researches have been made on the blood, the muscles and the joints in these cases and various investigators have found streptococci which they believe to be specifically responsible for the attacks.

### TREATMENT

If a focus of infection is found arrangements should be made for clearing it up and removing the pus. In acute cases, provided the focus of infection is in the tonsils, it may not always be advisable to remove the tonsils at once, but rather to wait for the patient's general condition to improve. Patients who are acutely ill should be handled as in other instances of acute infection. The bowels should be moved at least every other day and perhaps more frequently if the patient's condition permits; the mouth should be kept clean and all the phases of personal hygiene well attended to.

It has been believed that the salicylates have a special effect in rheumatism and it has been customary to give them in large doses. Many physicians have reported favorable results following their use. Hanzlik and his

associates made a comparative study of cases treated with and without salicylates. Their results indicate that the salicylates do not possess any unusual action or peculiar specificity in rheumatic fever. Prompt, though partial, relief was obtained in the majority of the patients receiving drugs other than salicyl. This was true for both early and late symptoms of the disease. In some patients in whom the symptoms persisted although considerably moderated, after treatment with nonsalicyl antipyretics and analgesis, salicyl appeared to give more permanent relief. Eliminating the elements of time, rest, and natural recovery, relief of late symptoms was brought about more effectively and permanently by salicyl than by combinations of drugs whose pharmacologic actions are similar, but different chemically. On the whole the salicylates must be considered as a symptomatic remedy which can be administered safely in large doses and which represents a fortunate combination of antipyretic and analgesic qualities making it more suitable and also desirable for the treatment of rheumatic fever than combinations of opiates and various antipyretics. As the salicylates in large doses may have an unfavorable action on the renal functions and the kidneys, they should be used with some slight degree of caution.

The salicylates may be given in doses of from 5 to 10 grains every two to three hours continuing the treatment for perhaps a week after the patient seems to be free from symptoms. At the same time potassium or sodium citrate are often valuable in keeping the system properly alkaline. Two grams (30 grains) three or four times in 24 hours for a time is generally sufficient for this purpose.

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#### PAIN

For the relief of pain a small amount of morphin is better than a large amount of a coal-tar product. This is always true when pain is constantly recurring. The repeated administration of any coal-tar preparation is inadvisable in acute conditions.

The most important measure is immobilization and protection of the inflamed joints. Measures may be employed which increase hyperemia.

The care of the individual joints which are inflamed cannot be dogmatically dictated. The joint and limb should be placed in the position that gives the patient the most comfort. If several joints of a limb are involved, and especially if there tends to be more or less troublesome muscle contractions, or an inadvertent movement causes excruciating pain, a splint may be devised to keep the limb at rest. Warm, moist applications, and perhaps nothing better than alcohol fomentations (one part of alcohol to 3 or 4 parts of warm water; a towel or napkin soaked in this and then wrung out just sufficiently not to drip, and this wound around the joint and then covered with oil silk) will probably give as much comfort as any application. These should be changed as frequently as they are cold. Sometimes dry cotton around the joint causes as much comfort as any application. The official methyl salicylate may be applied, or oil of wintergreen, but probably neither is more valuable than the above alcohol dressing. Diathermy, cupping and various hyperemic treatments may be of value.

The convalescence following rheumatism should be prolonged until the patient is thoroughly able to attend to his work. If there is a cardiac complication, prolonged rest is positively necessary. It can never be determined how much endocardial inflammation was present, how much valvular inflammation and thickening will be permanent, or how perfect the repair of the heart may be. Also, even when auscultatory evidence of cardiac complication has not been discovered, there may have been some inflammation which should call for prolonged rest. The administration of small doses of an iodid, best sodium iodid, from 0.10 to 0.20 gram (from  $1\frac{1}{2}$  to 3 grains) three times a day, is often advisable. Such treatment has frequently seemed to hasten or aid in the complete recovery of endocarditis. Not every endocarditis from rheumatism leaves valvular lesions.

Meat does not cause rheumatism, and prolonged abstinence from meat is generally inadvisable, still

but a small amount of purin foods should be taken for some time. Eggs, green vegetables, and cereals should constitute the main food; later, fish or meat once a day may be allowed.

#### COMPLICATIONS

Circulatory weakness during rheumatic fever may be combated with strychnin, with camphor, sometimes with caffein, and exceptionally with strophanthin.

In the treatment of this disease, it should be urged that the heart be watched daily by stethoscopic examination, to note as soon as signs of endocarditis occur. This complication is so insidious that it may not cause symptoms appreciable to the patient. There may, however, be an increase of temperature, as there may be cardiac pain or distress. While it is not the object here to describe the treatment of endocarditis, it may be stated that an ice bag over the heart may inhibit the inflammation, that the salicylates should be stopped if endocarditis occurs, and that rest and convalescence after complications should be prolonged.

#### CHRONIC ARTHRITIS

Chronic arthritis develops not only as a result of long continued bacterial infection but also on a basis of metabolic disturbances, gastro-intestinal derangement, etc. Bacteria may locally infect a joint and produce substances that are irritant. Mechanical injury to the joints whether irritation, pressure, overwork, or insufficient circulation from some old injury or anything that disturbs the nutrition of a particular joint or set of joints may become causes of chronic arthritis. The following localities deserve attention as being the possible sources of toxins in such cases: the teeth, tonsils, nasopharynx, bronchial tubes, bronchiectatic cavities, infections of the gall bladder, appendix, seminal vesicles or fallopian tubes.

#### TREATMENT

Primary rest is necessary as long as motion causes pain. The etiologic factor must be sought and removed if possible. The metabolism of the patient should be



studied thoroughly, and the analysis should include repeated examinations of the excretions. Worry, nervous frets and mental irritation should be avoided.

In the treatment of individual joints, the measures mentioned under rheumatism should be borne in mind. Hyperemia about the joints may be produced and body baking may be of value in more generalized affections. In varying time, from four to six weeks, passive motion with gentle massage may be begun. The amount of passive exercise must be gauged by the effect on the individual. The patient, always more or less nervous, tires easily. To these patients tire is painful. Day by day the exercise must be increased. The rest, restorative measures (food, etc.), should improve the general nutrition and blood circulation. In due time active exercise is added. This must be systematically and regularly performed. Usually a nurse or masseuse should teach the patient the lighter forms of calisthenics. These measures, namely: rest, restorative food, pure air, environment of optimism, graduated passive and later active exercise will overcome the debility, malnutrition and poor general circulation. Daily systematic passive and active exercises increased gradually must be continued until a relative restoration occurs. Otherwise a relapse is apt to occur because of neglect of one or more of the above important factors relating to nutrition, general and local blood supply, etc.

#### VACCINES

Autogenous vaccines made up of the dominating strains of streptococci obtained from the tissues and exudates of the focus of infection have been used but without any marked advantage. The general measures of management and treatment are absolutely necessary to succeed in helping these patients. To this management may be added autogenous vaccination without fear of harmful results. The use of vaccines in the treatment of chronic deforming arthritis without attempting to find or remove the dominating etiologic focus of infection and without a systematic hygienic management is irrational and most unjust to the patient.



## NONSPECIFIC PROTEIN INJECTIONS

Several physicians have reported favorable results in these cases following the injection of nonspecific proteins, e. g., typhoid vaccine. In sub-acute and chronic cases of osteoarthritis fifty million killed typhoid bacilli are given intravenously and if the reaction is only moderate the amount is cautiously raised at intervals of two or three days to a hundred and fifty million bacteria at an injection. It should be borne in mind that such methods have in them an element of danger and they should be utilized with due recognition of the possibilities. Moderately advanced heart and kidney diseases have not been considered contraindications, but only as demanding care in the preparation of the patient: seeing that the stomach is empty for some hours before treatment and the use of a small initial dose gradually increased but only after all the disagreeable symptoms that previously existed from the last dose have passed away and appetite has returned. The immediate effects following injection are a more or less uncomfortable feeling accompanied by a chill, rise of temperature and emesis. Before forming any final judgment it will be well to bear in mind the question asked by Theobald Smith in another connection: how much energy does a reaction of this sort cost the patient, and is the final result worth the cost?

## MEDICINAL TREATMENT

Medicinal treatment, except such treatment as is aimed to promote digestion, proper bowel activity, proper circulation, and proper character of the blood, is of little value. If there is thought to be hyperacidity of the secretions or at least decreased alkalinity, alkalies may be of value, but certainly alkalies should not be pushed to the point of interfering with stomach digestion. Salicylates are of but little value in chronic joint disturbances. Iodids in large doses will produce waste, and may be what a fat patient needs. Small doses of iodid stimulate the thyroid to extra activity, promote general metabolism, and may be of value in the individual case. The use of radium

emanation has been suggested and reports are available indicating that it may relieve pain and to some extent arrest the disease but the results are not permanent. Colchicum in chronic arthritis is probably of little value except as it may increase intestinal activity. All of the various lithia salts, and all of the various laxative and alkaline waters have no specific action, but if combined with increased muscular activity, increased activity of the skin, increased drinking of water in proper selected cases, a regulated diet and a regulated life, in other words, proper regime, they may be of apparent benefit. It is the regime, however, and not the particular kind of lithium or other salt that works the cure.

### ARTHRITIS DEFORMANS

The etiology of this disease is only now being worked out. The relation of infection elsewhere in the body to this disease has been emphasized, especially by Billings and cannot easily be overestimated. The changes in the joints are not due to the absorption of toxins from the focus alone, but to actual localization of the bacteria themselves. The difficulty in obtaining the causative organism is great, owing to chronicity; by special methods Rosenow succeeded in isolating peculiar streptococci from the excised lymph-glands draining the involved joints, from contracted and diseased muscles, and from excised portions of the diseased capsule of the joint itself, and recommended the use of a vaccine prepared from organisms thus isolated rather than from the streptococci in the focus. The use of even these vaccines, however, is quite futile unless the focus is removed. The peculiar character of the changes, in which there is a proliferation of endothelial cells in the blood-vessels about the involved joints with a consequent anemic necrosis, makes it clear that no matter what vaccine or other remedial agent is used, cure in advanced cases will be exceedingly difficult. Removal of the focus, the judicious use of autogenous vaccines in small doses prepared not from the focus but from the adjacent lymph-gland or tissue itself, together with rest, good air, passive motion and forced feeding comprise rational proce-

dures and yield substantial results. It is important to consider the special needs of each. In one instance important joints may have become ankylosed in unusable positions, or their motion interfered with by marginal exostoses. Appropriate surgical treatment will be of service in such cases. Other joints are benefited by immobilization with splints or adhesive tape. Continued infection, pain, and interference with locomotion may have resulted in partial invalidism, with attendant anemia, poor appetite and sluggishness of function of various organs of the body. With the removal of infection and all possible mechanical correction of deformities should go attention to nutrition by giving a well balanced general diet. Tonics containing iron may be of benefit. There is no drug therapy specific for this condition. The use of radium emanation has been suggested and seems to have a beneficial effect in some cases. Outdoor life and such moderate exercise as is consistent with the policy of rest for affected joints will help build up the general tone of the patient.

## ERYSIPELAS

### ETIOLOGY

In the majority of cases of the facial type the point of entrance of the infection is through the nasal mucosa following a coryza. In others there may be abrasions of the scalp or face, and in many instances, the infection may begin in an operative wound. Leg ulcers and wounds are the usual origin of infection in the extremities.

### ONSET AND COURSE

The attack usually begins with chills, general malaise, headache and a rise of temperature, which precede the appearance of the local lesion by from twelve to twenty-four hours. In many cases, however, the burning and redness of the skin are the first symptoms noted.

Typical facial erysipelas which starts at the bridge of the nose and spreads in butterfly pattern rather symmetrically over the cheeks, may remain thus limited, but in many cases it proceeds to involve the

ears, the forehead, the scalp and the neck, down to but not beyond the collar-line, except in the small percentage of cases which are of the migratory type. In the migratory variety it often affects the extremities symmetrically.

#### DIAGNOSIS

The diagnosis is made from the characteristic skin appearance, the fever, bleb formation and desquamation.

#### TREATMENT

The treatment consists of a purgative; a low diet, mostly cereal; antipyretic measures, if required, a bromid sedative, if needed; and later circulatory stimulation, if the heart fails. Meningeal complications must be watched for, and treated if they develop.

On the affected part, continuous cold compresses of boric acid solution may be of value. In migratory cases ichthyol may be applied or the areas may be painted with picric acid solution. Silver solutions have been advised. Magnesium sulphate solutions are often efficient as a sedative lotion. Many times a starch powder dressing is all that is needed.

#### BOTULISM

This severe condition, fortunately rather rare, follows the eating of food contaminated with the toxins of *Bacillus botulinus*, an organism whose spores are highly resistant to heat, and occurring usually in spoiled food. Careful investigations made by numerous packing interests and also by the laboratories of the University of California indicate that it occurs most frequently in home packed foods although undoubtedly authentic cases have occurred in commercially canned goods. Practically all kinds of packed foods have been affected including meats, vegetables, fruits, and most recently, ripe olives.

#### PROPHYLAXIS

Fortunately, food spoiled by *Bacillus botulinus* seems in most instances to have a cheesy odor, a bad taste and to be distinctly soft. These facts were frequently noted by those eating spoiled food, who, nevertheless,



persisted in eating the food and became severely sick as a result. It has also been shown that less danger attaches to food which is well washed and thoroughly cooked, and these precautions in the way of cleanliness should be followed as a matter of routine in food preparation for the table.

### SYMPTOMS

The first intimation of trouble in a large number of cases recently studied was an indefinite indisposition, followed rapidly by muscular weakness which gradually increased to great prostration. There is constriction of the throat, difficulty in expectorating, thick speech, dryness of the mouth and dysphagia. This is apparently due to paralysis of the pharyngeal muscles. Swallowing becomes increasingly difficult and finally complete aphonia may develop. The eye symptoms are among the earliest manifestations. Dimness of vision, a blurring and mistiness are noted. Diplopia is one of the earliest symptoms. Ptosis of the eyelids develops and nystagmus may be seen. Vomiting has been seen in some cases apparently associated with large doses of the toxin which produce gastric irritation. Patients who vomit at the onset seem to die earlier than the others. A feeling of pressure and weight at the pit of the stomach have been noted and also chilliness and profuse perspiration. The patients become drowsy and comatose immediately before death. Dyspnea manifests itself in difficulty of breathing. As the respiration weakens cyanosis appears.

### TREATMENT

Even when seen relatively early there does not seem to be great success in the treatment of patients who have had considerable doses of botulinus toxin. Stimulants such as strychnin sulphate, atropin camphor in oil, digitalis and caffein have been administered. Inhalations of oxygen have been tried. Gastric lavage is performed as soon as possible. It is doubtful that cathartics can serve any useful purpose, but if the patient's condition permits it is perhaps as well to



encourage elimination from the system of the affected foodstuff ingested. The patients should be kept warm and treated symptomatically.

Antiserums have been prepared and are available through the Hygienic Laboratory and will perhaps be made available through commercial houses. Dickson and Burke have shown that there are two definite strains of the botulinus organism and that antitoxin against one type has no affect in treatment when infection is by the other type. The whole subject is in a state of active investigation and perhaps further research will yield something of specific value.

### TETANUS

The incubation period of acute tetanus is from one to ten days, and of subacute tetanus from ten to twenty days. Fifty per cent. of all cases develop between the sixth and ninth day, the majority apparently on the seventh day after infection. Acute tetanus lasts from one to ten days, and subacute tetanus from ten to twenty days. Not until the patient has lived until the tenth day of the disease is there an equal chance for life. After the tenth day the patient's chances of recovery increase day by day.

There is probably always more or less leukocytosis in tetanus, and Hill found the average count to be 13,000. The eosinophils seem to be diminished in number.

The tetanus bacilli is a cylindric rod, larger at one end than the other, and is an anaerobic germ. It is constantly present in the dirt of cities and on most country roads, as well as in barns and pastures. Noble has recently shown that this bacillus occurs in the intestines of otherwise normal animals, and he found the germ in the feces of eleven of sixty-one horses examined. Further examination of these infected animals showed that the germ could disappear in a few weeks, but could also remain present as long as four months. Such animals become tetanus carriers, and are a constant menace to other animals which may receive injuries, and to their drivers and

hostlers, who may have slight wounds on their hands. These tetanus-carrying horses infect the dirt of the fields or streets on which they work or travel.

This bacillus gains entrance to the system almost always through a wound or abasion, and, as has long been recognized, the most frequently infected wounds are contusions and crushing or lacerating wounds, especially those that occur from sliding, grinding and friction injuries in the streets and from lacerating wounds acquired in warfare, explosions, Fourth of July injuries, etc. At first the infection is a local one, and it is stated that the bacilli do not often wander from the point of infection; but they soon produce their toxins, which cause the general disturbance.

#### SYMPTOMS

The beginning symptoms of poisoning from this germ are aches and pains in the muscles, with a general lassitude, some headache, and soon some stiffness of the muscles of the back of the neck, face and jaw. The wound or source of infection may show no change; in fact, may apparently be healed. The more or less permanent contraction of some muscles and the convulsions of tetanus are too well understood to need description. Spasm of the sphincters may make urination and defecation almost impossible. The mind generally remains clear, unless there is very high temperature, which is one of the causes of death. Death may occur during a convulsion from spasm of the diaphragm or spasm of the laryngeal muscles, or it may occur from exhaustion.

#### THE PREVENTION OF TETANUS

For convenience the important points in the prophylaxis may be summarized as follows:

1. Carefully and thoroughly remove every particle of foreign matter from the wound, laying it open, if necessary, under anesthesia.

2. Dry the wound thoroughly, and paint it and the surrounding parts as carefully as possible with iodine, or else cauterize it thoroughly with a 25 per cent. solution of phenol (carbolic acid) in glycerin or alcohol.

3. Apply a loose wet pack, using a solution of some such antiseptic substance as boric acid or alcohol.

4. As soon as possible inject intravenously or subcutaneously 1,500 units of antitetanic serum and continue the injections, if indications of possible tetanus arise. A special committee appointed in Great Britain to study tetanus as it occurred in the war has recommended that in every instance four prophylactic injections be given at intervals of seven days.

5. In no case close the wound. Allow it to heal by granulation. Remove the dressings and packing each day and apply fresh ones.

### THE TREATMENT OF TETANUS

#### ANTITOXIN

The use of full doses of antitetanus serum given as soon as the earliest symptoms appear is the measure of greatest importance in the treatment of this disease. The delay of treatment until the second or third day of symptoms, and the small doses (1,500 to 3,000 units) go far toward explaining the failure of older methods to reduce the death-rate in this disease. It is important that the full effect of the antitoxin should be obtained immediately and this may be accomplished by giving 3,000 to 5,000 units intraspinaly and 10,000 to 20,000 units intravenously at the earliest possible moment after symptoms of tetanus appear. On the following day the intraspinal injection may be repeated. The blood remains strongly antitoxic for several days. On the fourth or fifth day 10,000 units should be given subcutaneously to maintain the antitoxin content of the blood. If only a small amount of antitoxin (3,000 to 5,000 units) is available it should be given intraspinaly. Intraspinal and intravenous injections should be given with all the precautions usually employed for these methods. Cases have been reported in which as much as 200,000 units of the tetanus antitoxin have been given intravenously, the condition of the patient indicating the need of the serum.

Subsequent injections of antitoxin, especially when given intravenously, can cause anaphylaxis, sometimes

severe; and Simon thinks that injections later than the tenth day become dangerous from the standpoint of being likely to produce anaphylactic shock.

The prophylactic dose of tetanus antitoxin should be about 1,500 units, given subcutaneously, preferably in or about the region of the injury, and this should be given whenever the character of the injury or the region in which the injury is received presents any possibility of tetanus infection. This dose can be repeated in a few days if deemed advisable.

As in administering diphtheria antitoxin, it should be ascertained if the patient is susceptible to emanations from horses or stables; if he has hay fever and asthma symptoms from such emanations, it is unwise to administer horse serum, especially as a prophylactic for something that may not occur.

This use of antitoxin in no respect replaces other necessary recognized non-specific methods of treatment in tetanus. Surgical treatment of the site of infection should be instituted at once. The patient should be placed at rest in bed in a quiet, darkened room, and should receive sufficient sedatives to control convulsions, together with an adequate supply of fluid nourishment, and attention to the elimination by kidney and bowel. The necessity for large and continued doses of chloral should not blind the physician to the possible danger of giving an overdose.

#### OTHER DRUGS

The serotherapy by no means does away with the necessity for chloral or morphin. The dosage must be proportional to the age of the patient and the severity of the tetanus. Some clinicians give very large doses of chloral, but Permin thinks it is wiser to keep below the maximum dose and supplement the chloral with morphin, keeping the patient in a quiet, darkened room. It is of the utmost importance that the patient should get adequate nourishment as the resisting powers depend to such an extent on this. Fluid foods are best and with extreme lockjaw it may be necessary to resort to feeding through a nasal tube.

### MALARIA

Malaria, an infectious disease caused by the hemameba or *plasmodium malariae* is a disease marked by chill, fever and sweating periods and by its response to quinin. While comparatively rare today in most parts of the United States it still takes large toll of the population in Italy, Russia and the tropics generally.

### ORGANISM

The organisms are the tertian which requires 48 hours for development and causes a paroxysm on each third day; the quartan, developing in 72 hours and causing paroxysms on each fourth day; the estivo-autumnal, irregular in development and causing the severer types of the disease. The organisms may be sought for in fresh blood on a warm stage, but if such is not available it is possible to detect them in dried or fixed specimens using Wright's, the Romanowsky or other common stains.

### PREVENTION

The notable work of the United States Army and Public Health Services have shown that this disease may be completely eliminated in any community by the proper measures. It is carried by the female anopheles mosquito. These lay eggs in marshy places, and from these eggs the larvae develop in warm weather after two or three days. The larvae are air breathers and are therefore easily destroyed by placing petroleum on the surface of the water. Better still is the draining of marshes and breeding places. At the same time human habitations should be screened and while the work of draining and prevention is under way prophylactic doses of quinin should be administered to those likely to be affected.

### TREATMENT

The general treatment of the patient with malaria should be that given to equally severe symptoms in other infectious disease. It includes bed rest (continued through the interval periods of apyrexia); care of the diet, the bowels, the skin, etc.



During the chill the patient asks for warmth which should be given by the supplying of hot drinks in profusion, hot water bottles to the feet, warm coverings and similar measures. In the stage of fever the patient receives cool sponging, cool drinks, lightening of the coverings on the bed, alcohol rubs and similar physical and hydrotherapeutic measures. If there is headache it may be relieved by cold applications to the head or if intense by administration of a small dose of morphin. When perspiration begins the patient may be kept dry by rubbing with dry towels. Cooling drinks may be administered to aid in sustaining him.

### QUININ

There are numerous methods of administering quinin to these patients and practically every physician who has treated these conditions extensively will describe special methods which he uses.

Ochsner (*Jour. A. M. A.*, March 17, 1917) describes a technic of quinin administration with which hundreds of patients were cured in a community in which he visited. Some of them had been deemed almost incurable as they had not yielded to other methods. He mentions first twelve facts which are to be borne in mind during the treatment as guides to the physician: 1. Quinin will kill the adult *plasmodium malariae*. 2. Quinin will not kill the plasmodium in spore form. 3. Quinin will prevent spores from developing into adult forms. 4. Quinin, if given continuously, will consequently keep malaria spores in the body, which will later cause a recurrence. 5. Quinin must be absorbed in order to be effective. 6. Quinin must be kept constantly in the circulation, at least for forty-eight hours, in order to kill all plasmodia which belong to the one, two and three day type. 7. Quinin taken by mouth will not be entirely eliminated in three hours. 8. Quinin taken by mouth may all be eliminated in six hours. 9. It is consequently necessary to give quinin night and day at sufficiently short intervals to keep fresh quinin in the blood for at least forty-eight hours continuously. 10. The alimentary canal must be in a condition suitable for the absorption of quinin. 11. Hot

water in large quantity should be given with each dose of quinin in order to insure solution and absorption. 12. The use of quinin should be completely interrupted for a sufficient interval after all adult plasmodia have been killed to permit the spores to develop sufficiently to be killed by quinin, but not long enough to permit new spores to form; that is, the interval should be less than seven days.

He then gives the following rules for treatment based on these facts: 1. Give an exclusive diet of hot soup for ten days treatment. 2. On the evening of the first day give 2 ounces of castor oil in fruit juice. 3. At 6 a. m. of the second day begin giving a 2 grain capsule of quinin (preferably bisulphate) with cover taken off, with one half pint of hot water, every two hours night and day for thirty doses, being absolutely sure not to miss a dose, in order to keep fresh quinin in the blood constantly. It is important to insist on waking the patient at night in order that the intervals shall not exceed two hours at any time. 4. The following six nights and five days give absolutely no quinin, but give a pill containing  $1/50$  grain of arsenious acid, with one-half pint of hot water at 6, 9, 12, 3 and 6 o'clock. 5. Give castor oil as in Rule 2 on the evening of the fifth day. 6. At 6 a. m. following the sixth night, again begin to give 2 grains of quinin precisely as under Rule 3. 7. After that give general tonic and simple nourishing food. 8. Avoid reinfection by the use of screens and remaining away from locations where infected mosquitoes abound.

Mayne and Carter working under the auspices of the United States Public Health Service have endeavored to outline a standard form of treatment which will insure the giving of a sufficient dosage of quinin. The greatest dereliction consists in the insufficiency of the dosage of quinin and the aborted length of treatment. The course of treatment provides for the application of a minimum of seventy-five days in the administration of 800 grains of quinin bisulphate. For the first five days 10 grains of quinin bisulphate should be given four times daily. At the end of this period there should be no severe paroxysms, no chills, and only

young rings and mature gametocytes in the blood. For the next ten days 5 grains of quinin bisulphate should be given four times daily. About the middle of this stage the patient, who should have been in bed, should probably be out of bed and clinically and apparently normal. With the exception of the gametocytes the parasites will not be demonstrable microscopically in the blood. The patient should then be able to resume his normal activities. For the next twenty days, however, he may receive  $2\frac{1}{2}$  grains of quinin bisulphate every four hours and arsenic in the form of Fowler's solution or some other tonic should be prescribed. Finally for a period of forty days 5 grains of quinin bisulphate should be taken daily with a tonic continued if the patient seems to require it. It is understood, of course, that the treatment is to be modified to suit the individual case—young adults or chronic cases in older persons—where the dosage indicated might not be wholly desirable.

In cases of pernicious malaria, quinin may be given, in suitable preparations, intramuscularly and rarely intravenously. As there may be marked idiosyncrasy to quinin in some cases the intravenous method may be used only when it seems absolutely necessary and when previous inquiry has elicited the fact that there are no contraindications.

## TUBERCULOSIS

Under the general title of tuberculosis are included the various pulmonary forms, abdominal forms, tuberculosis of the bones, glands and other organs of the body. This is a disease of civilization and hence due to the congregation and crowding of mankind into small regions, as cities. Thousands of persons suffering from pulmonary tuberculosis are walking our streets and expectorating billions of tubercle bacilli daily.

### ETIOLOGY

The discovery of the tubercle bacillus by Robert Koch, in 1882, and the proof that this bacillus was the cause of tuberculosis, changed the established belief that tuberculosis was hereditary to the belief that it

must always be acquired. This is of course a most constant fact, but the part that heredity plays in the development of tuberculosis, in furnishing proper ground in which the bacillus may grow, or in offering a condition of low-grade immunity against this disease, is progressively becoming more prominent. A human fetus can be born with tuberculosis, but comparatively few such cases have been recorded. If one were roughly to estimate the number of such authentic instances it might not be far from one hundred, and in most of these the mother was the tuberculous parent.

Tubercle bacilli have rarely been found in the milk of an infected mother. Therefore, direct infection from this source is improbable. It is possible, however, that toxins from the tubercle bacillus or from a secondary infection of the mother may be eliminated in the milk and cause, in the child, gastro-intestinal disturbance, fever and emaciation. It is improbable that the milk could furnish any substance that would render the child immune to tuberculosis. The therapeutic conclusion is positive that a tuberculous mother should not nurse her child, not only for the child's sake, but also for her own, as the mother rapidly grows worse through the nutritional loss caused in producing the milk.

Statistics show that the person who is underweight and has a family history of tuberculosis is more likely to develop the disease than one who is underweight without a family history of tuberculosis. On the other hand, a person of full weight or overweight, whatever the family history, while not precluded from the possibility of developing tuberculosis, is much less likely to have it than one who is underweight. Also, one who is underweight is more likely to develop tuberculosis than a person of normal weight. Whether or not, the majority of underweight persons harbor tuberculosis germs and such a condition predisposes to underweight has not been demonstrated, but it is quite possible.

As is apparently true of most germ diseases, a race that has but recently acquired the disease is more susceptible to its inroads, and has the disease more actively than a race that has long suffered from it. Also, a change from outdoor life and a dry, clean air



environment to indoor or to city life, or to a region where the air is damp or dust laden, predisposes to the development of tuberculosis.

These bacilli almost invariably gain entrance to the system by one of two ways: by inhalation, as occurs in the majority of cases, or by swallowing. A germ that is so constantly present in almost every community of civilized peoples must be breathed and swallowed by most persons. Something in the individual must tend to kill these germs before they acquire a home, that is, before they congregate in sufficient numbers to perpetuate themselves. Nothing probably tends more to prevent the acquirement of this disease than general good health, which especially means health of the upper-air-passages and throat, the absence of bronchial catarrh, healthy tonsils, a normal digestion and healthy intestines. The evidence that the tonsils may be a portal of entry Ravenel believes is very conclusive. The tubercle bacillus probably cannot find a living chance unless there is some disease, injury or chronic disturbance in one of the parts of the body mentioned, and unless a sufficiently large number of them are inhaled or swallowed at once, so as almost to overwhelm the person's ability to destroy the germ. Of course, it is possible and perhaps probable that, although this disease gives no immunity, a patient in whom the disease has been arrested or in whom the disease once active is now chronic or more or less latent, may produce, or have already circulating in the body-fluids, enzymes that may destroy the tubercle bacillus more readily than is possible in one who has never had the disease.

Perhaps many conditions that we have termed causes predisposing to tuberculosis may really stimulate to activity latent tuberculosis or a tuberculous focus harbored and concealed somewhere in the patient's body. Whichever of these two suppositions may be correct, we recognize that a patient is likely to acquire, or having acquired, at least may develop an active tuberculous process when he is anemic; when he is under weight; when he is continuously overfatigued; when he has a tendency to recurrent colds,

especially to recurrent bronchitis; when he does not quickly recuperate from any simple acute infection, whether it be grip, measles or whooping-cough, etc., or when he has suffered from a more serious acute infection, such as some prolonged septic process or typhoid fever, and especially when he does not recover quickly from a pneumonia or a pleurisy with effusion. Pleuritic effusions are considered as perhaps generally tuberculous in origin. None of the surrounding predisposing causes, such as unsatisfactory housing and occupations that are dangerously dusty, need to be considered here.

A child is considered predisposed to the development of tuberculosis, or perhaps already has a latent tuberculosis, if he is pale, has a tendency to eczemas, or has enlarged tonsils or postnasal adenoids, and especially if he has enlarged cervical glands. Caries of the teeth is also perhaps a predisposing cause, as decayed teeth may harbor all kinds of germs. Therefore to allow caries of a child's first teeth to persist, because they will soon be lost with the eruption of the second teeth, constitutes serious neglect. An enlarged cervical gland probably always shows that an infection entering through the tonsil has invaded the next fortress of protection, namely, the cervical glands. If the infection is tuberculosis, the gland may be actively tuberculous, and evident tuberculous adenitis is the condition. Much more frequent and not evident, but often found by good roentgenograms of the chests of children, is the involvement of the bronchial glands by the tuberculous germ having perhaps first gained entrance through the tonsils, and this without any involvement of the cervical glands. In fact, it has been repeatedly demonstrated that perhaps the majority of children affected with tuberculosis have the initial lesion in the tracheobronchial and hilus glands.

The bovine tuberculosis is frequently transmitted to children through milk by way of the intestine has for some years been thoroughly established, and it has been shown that many instances of glandular tuberculosis are due to this type of bacillus. General tuberculosis rarely, but udder tuberculosis almost always,

infects milk with tubercle bacilli. The frequency with which bovine-tuberculosis-infected milk causes tuberculosis in children is still more or less a subject of dispute. Many experiments have shown that the gastric juice does not necessarily, if ever, kill the tubercle bacillus.

#### MEASURES THAT WILL CAUSE A DECREASE IN THE INCIDENCE OF THIS DISEASE

These may be enumerated as, primarily:

1. General instruction in hygiene and in the conditions that predispose to this disease.
2. Tenement-house laws to prevent overcrowding.
3. Sunlight.
4. Open windows, verandas and roof-gardens.
5. Municipal breathing-spaces; parks, playgrounds, etc.
6. Proper ventilation of all churches, theaters, halls, and assembly rooms.
7. Open-air schools, or open-window schools.
8. Laws prohibiting spitting on the streets and in buildings.
9. Better factory sanitation; better methods of cleaning public buildings and public conveyances.
10. Special laws against the dissemination of dust in factories, foundries and all occupations in which it may be inhaled.
11. Better hygiene and improved buildings for all general hospitals, **prisons** and jails.
12. Better laws for the more scientific control of tuberculous cattle, and compulsory cleaning and improving of cow-barns and farms used for producing public milk-supplies.
13. Certification or pasteurizing of all milk used for infant-feeding.

Personal preventive measures are:

1. Compulsory report of every case of tuberculosis.
2. Careful instruction of the family in the care of the tuberculous person, if he is to remain at home.
3. Careful personal instruction of the patient, if he is at an age to receive it, as to the possible methods of communicating the disease to others.

4. Sanatoriums for incipient cases of pulmonary tuberculosis.

5. Isolation hospitals for advanced tuberculosis patients whose home surroundings are inadequate.

6. Skilled dispensary care of ambulatory cases and visiting nurses for "follow-up" work.

7. Sanatoriums or rest-hospitals for joint and bone tuberculosis; these are of special value when located at the seaside. (The value in glandular tuberculosis of seaside sanatorium or veranda rest-cures should also be recognized.)

8. Careful instruction to reduce the morbid fear of other members of the family, and for the mental comfort and happiness of the patient. This should be given, both by the board of health and by the attending physician, to the effect that the disease is not contagious, and that if the instructions urged are properly carried out the probability of acquiring the disease from the patient is practically nil.

9. It has long been known that pregnancy in a tuberculous woman is a dangerous complication. Though she may appear to have better health during the pregnancy a fatal issue may follow rapidly after parturition. Knopf and many others who have recently considered this subject believe that there should be a maternity sanatorium or special wards in existing sanatoriums where prolonged antituberculous treatment may be given to the tuberculous women who wish to bear children.

#### PRETUBERCULOUS SYMPTOMS

The earlier we recognize the signs of probable or even possible tuberculosis, the better, as prevention is far easier than cure, though a cure is probable all through the first and second stages, and possible even in the third stage of the disease.

The conditions which predispose to this disease have already been enumerated. Besides correcting these conditions, we should use every means to build up the general system by tonics, outdoor life, change of climate, and by proper tepid or cold water sponging in the morning which causes the skin so to react that colds are not readily acquired.



At a very early stage there may be no lung signs, and it may be impossible to determine whether or not the bronchial lymph-nodes are enlarged or diseased. There are loss of weight, more or less gastric disturbance, pallor, lassitude and vasomotor disturbances shown by cold hands and feet; or the latter may be intermittently very hot and dry. There is generally a history of progressive loss of weight, irregular chest pains, shallow breathing, dry cough, especially on deep inspiration, and, most important symptom of all, an afternoon or evening rise of temperature, not explainable by any tangible cause (although it must not be forgotten that occasionally such a temperature can be of nervous origin). Gastric indigestion, with loss of appetite, is often an early symptom of pulmonary tuberculosis. An anal fistula is generally secondary, and is not often primary to the lung lesion, and the discharge from it may contain tubercle bacilli, as well as staphylococci and streptococci. There may be some other chronic suppuration present, as a middle-ear catarrh. While anemia is generally an early symptom, in the early stages there may be an increase in the number of the red-blood corpuscles. Amenorrhea, even without anemia, in girls and women is generally an early symptom; but women can complete one, or even two pregnancies while tuberculous.

While we are studying every symptom, and the lung symptoms are so few, to ascertain whether the patient really is tuberculous, a personal history of much sickness, especially colds, enlarged glands, chronic joint and tendon swellings or recurrent diarrheas, even if there has been no actual pulmonary consumption in the immediate family, renders the tendency, and hence probability of tuberculous infection, much greater.

In making the physical examination it should be remembered that it has long been decided that the flat, broad chest, contrary to previous belief, is less likely to be tuberculous than the rounded, barrel-shaped chest. Also, the chest circumference in the nipple line should measure anatomically half the height of the person. The expansion, unless the patient is abdominally obese, should be from  $2\frac{1}{2}$  to 4 inches; 2 inches,

though accepted by army requirements, is a very small expansion for a young adult. The inspection of the chest may show a lagging of one side during expansion, which may, however, be most noticeable with the finger-tips placed under the clavicles. This sign is very suggestive. The typical impaired percussion-note, imperfect breeziness of the inspiratory murmur, lessened depth, slight jerky inspiration, slightly prolonged expiration, slightly increased vocal resonance and localized râles, either dry or moist, with increased muscle resistance over a diseased area, with pleuritic pains in the upper part of the chest or between the shoulder-blades, are all too well understood to require elaboration. Very suggestive is the axillary, dripping perspiration during examination. Also suggestive is the little dry cough during the required increased inspiratory effort. This dry cough, hardly noticed by the patient, has probably been observed for weeks, if not longer, by the patient's family.

A study of the temperature of the suspected person is important; the temperature should be taken every three hours during the day for several days, or at least at 8 o'clock in the morning, at 4 in the afternoon, and at 8 in the evening, if not more frequently. A recurrent rise of temperature in the afternoon or evening, without any assignable cause, is almost pathognomonic of a latent tuberculosis becoming active. Some patients who show no temperature at rest will have quite a rise of temperature on the least exercise. Temperatures taken under the tongue are not so accurate as when properly taken in the axilla. Many a patient whose temperature is normal by the mouth will be found to have a higher temperature in the axilla. Of course, the most accurate is the rectal temperature, but this is rarely necessary for the diagnosis. An increased pulse-rate, over a hundred, with or without rise of temperature, is very suggestive, and if the pulse-rate is higher than the temperature would call for, the likelihood of tuberculosis is increased.

A slight hemorrhage of arterial blood always causes the laity to suspect phthisis, and the suspicion is quite generally correct. Hemorrhages can occur from the blood-vessels of the throat and larynx, although

they are generally very small in amount, and most frequently venous, and many a patient has been condemned to treatment for tuberculosis on account of a perfectly simple throat hemorrhage.

The occurrence of typical night sweats, that is, cold sweats toward morning, is a frequent and suggestive symptom of tuberculosis; but patients who have been weakened by illness, overwork, or overexertion may have this symptom for a short time, although it should always create suspicion.

A rarely noted symptom of tuberculosis, which may occur early in the disease or not until later, is atrophy of the mammary gland on the affected side; also, the hand and foot may be colder on the side affected, or if they are hot and dry, may be warmer than on the other side of the body. Conjunctivitis, blepharitis and an inequality of pupils, with dilatation of the pupil on the same side as the affected lung, have been noted. The skin of the tuberculous patient is often dry, and may be rough and sallow; there may be increased pigmentation, especially around the nipple on the diseased side, and there may be chloasmic spots. Bright red spots on the cheeks, and the glistening eyes occurring in the late afternoon, with the hands dry and hot, are almost pathognomonic. At other times of the day there is pallor, with the veins prominent all over the body; the face looks sad, and there is languor and a rapid, collapsing pulse. These are all signs that may occur at an early period.

Before deciding that the sputum of a suspected patient, or a patient who has incipient tuberculosis, is free from tubercle bacilli, several examinations must be made. The sputum may be found free from bacilli on several days, and then on the last day of the examination found to be loaded with them. The number of bacilli found has no great bearing on the prognosis of the disease. On the other hand, if large numbers of tubercle bacilli continue to be present after considerable periods, probably cavitation is either present or developing. The prognosis can hardly be made from the character or appearance of the tubercle bacilli, although it has been thought that large numbers of the smaller tubercle bacilli show greater activity of the disease.

A fluoroscopic examination of the chest will often reveal, even before clouding of any portion of the lung occurs, a diminished excursion of the diaphragm on the affected side. This is very suggestive of tuberculosis. Roentgenograms may show areas of beginning lung trouble as well as diseased bronchial glands. Besides the skin tuberculin tests, the conjunctival test and the interdermal test, all of which are more or less reliable, a positive diagnosis can generally be made by injecting the original tuberculin subcutaneously.

A number of substances can produce a reaction in tuberculous patients similar to that from tuberculin. Nucleoproteins, cinnamic acid and some alkaloids can do this.

The tuberculin used in making the test for tuberculosis is a purified extract prepared from tubercle bacilli. The details of its preparation need not be described here. Its injection causes a leukocytosis and stimulates the production of ferments, especially in the cells and tissues immediately surrounding the tubercles. These ferments then act on the poisons that have been produced by the tubercle bacilli and have accumulated in the tubercles.

The fever reaction is due to the toxins set free from the tubercles and to the action of the enzymes on these toxins. If some form of tuberculin is used for curative purposes, the reactions will become less and less, as more of these sealed-in toxins are set free. Also, reaction may be less as the system becomes less sensitive and hence immune to the irritation of these toxins. It can readily be seen that if too large doses of tuberculin are administered either as a diagnostic test or as a curative treatment, such a large amount of these toxins might be liberated as to cause an intense fever reaction, to the disadvantage of the patient. Also, it is quite possible by such treatment to liberate live tubercle bacilli and cause general infection. Hence the greatest possible care should be exercised in using tuberculin, either as a test or as a treatment, and the first doses should be of minimum amounts.

As tubercle bacilli are not readily killed by leukocytes, the latter surround the mass of bacilli and disintegrating and caseous material; the resulting lesion is called a tubercle. The fight, then, of enzymes and



toxins goes on between the two opposing factions. Some of the leukocytes and some of the bacteria die, with the production of toxins and enzymes. If these are liberated by the local inflammatory process the fever reaction and the other concomitant symptoms occur in the person if sufficient amount of the toxin circulates in the blood. Every tubercle that breaks down and is evacuated into the bronchial tubes and expectorated, is a step toward recovery. This satisfactory process, however, cannot go on without a general disturbance of the patient, with loss of appetite, loss of weight and emaciation, and it becomes a question whether the person can stand the disease until the tubercles are evacuated, and whether or not such evacuation will produce cavitation. The object of a tuberculin treatment is to aid the patient slowly to eliminate his tubercles when the disease in him has come to a standstill, and he shows no tendency to recovery, even if he is not growing worse. The theoretical object, then, aimed at by treatment is the elimination by the patient of most of the tubercles, or the permanent encapsulation of those not eliminated by such fibrous and calcareous material as will cause them to be forever outside of the body, as far as any relationship to the blood and lymphatic circulation is concerned. On the other hand, if too many tubercles are broken down at once, too persistently or too continuously, the prognosis is bad, and tuberculin is ordinarily not indicated.

Our conclusions as to the subcutaneous tuberculin test may be as follows: 1. It is a reliable test, and is pathognomonic in children and young adults. In older adults, if the test is positive, it may be relied on as showing a tuberculous focus somewhere, but if the test is negative it is not so reliable as in children. 2. It should not be used carelessly, though perfectly safe if the beginning dose is small. 3. The tuberculin test is unnecessary when a localized pulmonary lesion has been discovered by physical examination. 4. When we recognize that a patient is tuberculous or is liable to become so, although we find no physical lesions, the tuberculin test is unnecessary, as our preventive treatment should be the same whether reaction is posi-

tive or negative. 5. In doubtful bone, tendon or joint inflammations, or when for any reason a decision must positively be made, the tuberculin test should be used.

Although a reaction from tuberculin has occurred in cases of carcinoma, syphilis and actinomycosis, still, these instances are so rare that there is the probability that such patients had a latent tuberculosis, and hence the test may be considered positive. In advanced cases of tuberculosis, however, the test may be negative on account of a tolerance to the toxins already described.

The beginning dose of "old tuberculin" for diagnostic injection is 0.1 mg., the second dose should be 1 mg., the third may be 3 mg. and the fourth 5 or 6 mg. Of course, a reaction occurring with any dilution would prevent the necessity or advisability of giving another injection. A suspected patient not reacting to 5 or 6 mg. should be considered free from tuberculosis.

If a physician desires, he may receive direct from the serum and bacterin firms the "old tuberculin" properly diluted for the diagnostic test.

The tuberculin injection test should be used only with a patient who is at rest and does not have a morning rise of temperature as shown by a series of observations. The injection should be given at about 9 p. m., and if there is a rise of temperature in the early morning, it should be considered a positive reaction, and if there is pain, swelling or heat discovered at an external suspected area, as a joint, or if there is congestion or moist râles are discovered in a suspected area of lung-tissue there is a "focal reaction." If there is a marked reaction at the region of the injection (the "local reaction"), even if there is no general reaction, the patient probably has tuberculosis, and it may often be unnecessary to continue the injection of higher dilutions.

The "intradermal" tuberculin test for the diagnosis of latent or concealed tuberculosis is now frequently used. The advantage of this test over the von Pirquet and the Moro skin tests is that a known amount of tuberculin is injected between the layers of the skin. The reaction is a local one, and there is no general disturbance like that occurring with the subcutaneous tuberculin test.

GENERAL MEDICATION IN THE TREATMENT OF  
TUBERCULOSIS

In the first place, drugs, as such, cannot cure, and are not antidotes to this disease. On the other hand, much can be done, with proper medication, to aid the physiologic process.

*Calcium.*—It has long been thought that patients suffering from tuberculosis have previously become demineralized. This means especially that they have lost their calcium, and perhaps phosphorus, equilibrium. It is also true that tuberculous lesions heal by more or less calcification. Also, patients are more likely to have hemorrhages, if their calcium blood-content is diminished. Certain it is that patients, especially children, often improve with increased amounts of calcium in their food or as a medicament. One of the great values of a proper amount of milk for tuberculous patients is probably the calcium and phosphate content. On the other hand, many patients improve by the administration of a calcium salt.

*Creosote.*—Creosote has been long recommended and much used, and its action in tuberculosis has been lauded by able medical men.

There is a great difference of opinion among clinicians as to the value of creosote in pulmonary tuberculosis. Many physicians never use it in this disease, and others push it to such an extent that the patient is practically saturated with it, and his room and almost the whole house reeks with the odor of creosote. It seems to be true that many patients have improved appetite under its stimulant or irritant action in the stomach. It may also, for a time, improve digestion, and the patient often adds weight. During this period there is frequently a lessening of the bronchitis, and therefore a decreased expectoration, and with this decrease of the secondary (streptococcic) infection, there is likely to be less fever and therefore less sweating. It is so rare, however, for a patient to take creosote and not adopt the rest cure and other measures that go toward improving his condition that it is not fair to attribute such improvement to the creosote. Creosote is also more or less of an intestinal antiseptic.

tic, and hence bacteria-laden sputum that may be inadvertently swallowed may be rendered harmless in the upper part of the intestine. Be that as it may, it is a fact that good bowel activity, an improvement in the intestinal digestion, and the prevention of fermentation or putrefaction in the intestine, by many so-called bowel antiseptics, will all cause an improvement in the tuberculous patient.

Unfortunately, as frequent aftermaths of the good action of creosote the pancreas becomes overstimulated by the drug and does not furnish its secretion properly; there is intestinal indigestion; the liver is disturbed; there are stomach indigestion and loss of appetite, and the patient will lose weight faster than he gained it under the creosote treatment. Too much creosote will also irritate the kidneys, and may cause albuminuria. In other words, it generally does not seem wise to recommend creosote, as such, internally in pulmonary tuberculosis. As an ingredient of an inhalant mixture it may be of value, as a positive antiseptic to the upper air-passages and the trachea and large bronchial tubes. If there is fetid, purulent expectoration such inhalations may be of advantage.

Guaiacol frequently in the form of a benzoate of guaiacol has been used for tuberculosis, but guaiacol has no advantage over creosote in the treatment of tuberculosis. The exponents of the creosote treatment believe that the drug should be begun in small doses and gradually increased to the point of the patient's tolerance. Tolerance means that the appetite is not interfered with, that there is no nausea or vomiting, and that the urine does not become dark and show albumin.

The symptoms of creosote poisoning are similar to phenol poisoning. From its overaction the patient not only has gastritis and intestinal disturbances, but also dark urine (perhaps nephritis), dizziness and sweating.

*Cod-Liver Oil.*—This oil is a food, and as such has its advantages. A small dose of cod-liver oil is as easily taken as a large dose of some emulsion which contains but little of the oil. In other words, if one desires to give cod-liver oil, it may be given; but, as previously stated, other oils and fats are often of as



much advantage, particularly butter, and it certainly is not wise to load the system with large amounts of bile-salts. There is no difference in the effect of Norwegian cod-liver oil and the oil prepared on our own shores.

*The Hypophosphites.*—There is no chemical, physiologic or specific excuse for giving the hypophosphites; the success of treatment of lung conditions with hypophosphites is a fallacy. It is not intended to state that some phosphorus and some calcium-bearing preparations and foods containing these elements may not be of value, but one is not justified in expecting results from any hypophosphite combination of these or other elements.

*Arsenic.*—Arsenic has been advised for years in many lung conditions. It has been stated that the arsenic eaters of France and Switzerland have been more or less immune from tuberculosis. It has been stated that patients breathe more freely and better under the influence of arsenic. However this may be, in the treatment of pulmonary tuberculosis the value of arsenic is very slight. It seems to stimulate the production of blood-corpuscles, both red and white, and in small doses it may stimulate the appetite. In large doses arsenic is harmful, as it tends to cause destruction of red blood corpuscles, to irritate the kidneys, to upset the digestion, and when pushed, may cause multiple neuritis. In other words, arsenic is a poison, and should not be administered to a patient unless there is a tangible, positive indication.

*Iodin.*—For many years this element in some form has been given frequently for various kinds of tuberculosis, especially glandular tuberculosis. As the thyroid is generally disturbed in tuberculosis, iodine in small doses may be of benefit.

Harm has been done in pulmonary tuberculosis by the administration of an iodide. It seems to be a stimulant to the tubercles, not unlike tuberculin, and may cause a lighting up of a quiescent tuberculous process or a serious exacerbation of a slow-going infection. The stimulant action on glands is well known, and tuberculous glands may be overstimulated to the harm of the patient. In other words, iodides should not

be used carelessly in pulmonary and glandular tuberculosis. This does not militate against the possibility of small, very slowly increasing doses of iodine doing the same good that graded doses of tuberculin do, but the treatment should be most carefully watched.

*Chemotherapy.*—The success of salvarsan in syphilis has stimulated similar experiments with regard to tuberculosis. These include the use of methylene blue and compounds of arsenic copper, various dyes and other substances. Most prominent has been the work with cyanocuprol by various Japanese investigators and most optimistic claims have been made for this substance. None of the numerous substances studied, however, as yet warrants the hope that a specific treatment has been found. Certainly these drugs should not be tried in the human until they have been thoroughly tested by the usual experimental methods.

*Tuberculin.*—Tuberculin is not in itself curative, but it is, at most, a stimulant to the curative efforts of the organism. Many observers are of the opinion that it is of value in selected cases of tuberculosis. The potency of tuberculin for harm is recognized by all. Its administration requires careful selection of the case, close observation of the patient and appropriate regulation of the dose. Patients should be treated in a hospital, or, if the remedy is administered to ambulant patients, a strict control should be exercised. The results are frequently good in the forms of localized tuberculosis called surgical, such as affect the skin, bones, joints, lymph-nodes and larynx. Tuberculosis of the lungs, when strictly localized, would appear to indicate its use, but the different character of the tissue involved seems to render the results less favorable.

*Heliotherapy.*—Treatment by the direct rays of the sun has been applied by Rollier of Leysin, especially in cases of pulmonary tuberculosis complicated by local tuberculosis of the bones, joints or glands. It is being used more and more in ordinary cases of pulmonary tuberculosis. It should be applied with caution, where there is fever or a tendency to hemoptysis. It consists in graduated exposure of the body to the light of the sun for increasing periods daily until the resistance developed permits a long stay in the open

air. The treatment is said to be well borne by children. During the treatment the head should be protected and the room should be comfortable for the patient.

Gauvain (*Brit. Jour. Tuberc.*, 1916, 10, 111) believes that sunlight is an important adjunct in treatment of tuberculosis. He summarizes the action of sunlight as follows: On the local lesions it has at first a direct effect. Superficial micro-organisms are destroyed or inhibited by the sterilizing action of the light waves, and this action is assisted by the inflammatory response which results from a reasonable exposure to strong sunlight. The author has formulated a number of rules which must be observed when this treatment is given: 1. The patient's head must always be protected. 2. The patient must never be allowed to become too cold or too hot. 3. On the first day the legs to the knees may be exposed hourly for five minutes. If this is tolerated well, exposure of the knees may last for ten minutes hourly. On the third day exposure of the thighs for ten minutes hourly, and on the fourth day, similar exposure for fifteen minutes may be attempted. On the fifth day exposure of the thighs for fifteen minutes and of the body for five minutes is desirable. On the sixth day exposure of the thighs for fifteen minutes and of the body for ten minutes hourly may be attempted. If the patient is pigmented, the periods of exposure may be gradually increased, until the patient may be completely exposed for periods, and, when pigmentation is fully established, continuous exposure may be undertaken. 4. Blistering must be carefully avoided. 5. If the temperature exceeds 100 F., the patient should not be exposed the following day, unless special orders are given. 6. Sinuses should be exposed and any purulent discharge from them should be immediately swabbed. 7. A nurse must be on duty during the whole time.

#### TREATMENT OF SYMPTOMS

*Fever.*—Nothing tends to diminish the temperature more than the rest, quiet and fresh-air treatment already outlined. The patient who has high fever

should not be given too much food at any time of day, even if the disease is tuberculosis; and most of what he does receive should be given during an afebrile period, if possible. If he is suffering from acute tuberculosis, the nutrition should be much the same as for any other serious fever.

Sponging with hot water will often give these patients comfort and, if they have profuse sweats, it keeps the skin clean. The frequency of such sponging will, of course, depend on the height of temperature and its continuance. Antipyretics are rarely indicated. The following points should be observed in the treatment of fever: First and foremost, absolute rest in bed, preferably out of doors; artificial pneumothorax in selected cases; the cautious use, if at all, of tuberculin, and then only after other measures have failed; hydrotherapeutic measures suited to the condition and comfort of the patient; ample diet, but not necessarily "forced feeding"; and the judicious use of medicinal antipyretics.

*Cough.*—The treatment of the cough depends on whether it is dry or moist, and whether expectoration is easy or difficult. If the cough is dry and hacking, much of it may be prevented by the will-power of the patient. It should not be forgotten that many dry, irritating coughs are due to a lingual tonsil or throat irritation. Soothing, alkaline gargles, non-irritating inhalations of simple steam or steam medicated with some non-irritant drug, as a small amount of pine oil, will give relief. Many coughs of this kind are relieved by swabbing the lingual tonsil with boroglycerid. These dry, irritating coughs should be relieved without giving medicine by the stomach.

If there is considerable bronchitis with insufficient expectoration, or the cough is frequent without expectoration, the following cough mixture is soothing:

	Gm. or C.c.	
℞ Codeinae sulphatis.....	20	gr. iv
Ammonii chloridi.....	5	ʒ iss
Syrupi acidi citrici.....	25	flʒ i
Aquae .....q. s. ad	100	flʒ iv

M. Sig.: A teaspoonful, in plenty of water, every two, three or four hours, as needed.



Codein is the best sedative preparation of the opium series to meet the indication. The action of all other expectorants is inferior to that of ammonium chlorid, and ammonium chlorid as prescribed above is not disagreeable. The dose may be taken in Vichy or other sparkling water if desired. None of the multiple sweet, sickish, syrupy preparations offered by proprietary firms should be used in the bronchitis and catarrh of tuberculosis, or in any other kind of bronchitis. It is not necessary to cause nausea or vomiting because a patient has a cough. The success of some of these syrups or malt preparations in dry cough is due to the fact that they soothe the throat and lingual tonsil. Such irritation can be allayed without the patient swallowing a mixture.

If the cough is loose, and if the expectoration is profuse, the stimulating effect of ammonium chlorid and the sedative effect of codein are not needed, and terpin hydrate becomes the best drug to use as an expectorant. To meet this indication of profuse bronchorrhea it will not ordinarily be necessary to combine it with codein. It should never be given in solutions, as not enough of it to be of advantage can be dissolved in any solution. It may be given in tablet, powder or capsule, and the usual dose is 30 cg. (5 grains), given with plenty of water four or five times in twenty-four hours.

If there are cavities in the lungs, the patient should occasionally, by lying over the edge of the bed, allow gravity to aid him in expectorating the fluid and pus. Elevation of the foot of the bed is often of advantage. Sometimes inhalants containing creosote, oil of pine and benzoin are valuable. When there are large cavities which continue to fill up and cause septic fever, with the debility and loss of appetite that go with it, or when there is danger of serious hemorrhage, it may be wise to inject air or nitrogen into the pleural cavity and compress the diseased lung. Such treatment should be given only in hospitals or sanatoriums, and then by an expert, as very unpleasant symptoms may occur; the heart may be unpleasantly pressed upon and the outcome serious. On the other hand, the treatment is sometimes very satisfactory.

*Pain.*—Pain in the chest is most frequently due to localized pleurisies, but it may be a neuralgia, or referred pain caused by disturbances of the more deeply seated nerves. Nothing is of more advantage in easing such pain than temporary strapping of the part of the chest affected. This is especially true of pain in the lower part of the thorax. Sometimes a hot-water bag will ease the pain; rarely a sedative may be indicated, but generally it is not needed. Mild counter-irritation by a liniment or ointment is sometimes advisable over these regions of pain; blisters are rarely expedient, though the thermocautery may be used. Dry cupping may give relief.

*Hemoptysis.*—Blood-tinged sputum or very slight pulmonary hemorrhages as evidenced by small clots or streaks of blood require no special treatment. Expectoration of pure blood, or coughing up a little blood repeatedly requires attention. Such a patient should rest, and should undergo no exertion. The diet should be light, and hot foods or hot drinks should not be taken for a day or two, until the hemorrhage ceases. For this kind of bleeding little other treatment is necessary. If the bleeding is more severe, the patient should immediately be placed in a semirecumbent position, with loosened clothing and should be assured that there is no danger, as there rarely is danger from hemorrhage during all the early stages of pulmonary tuberculosis. In the late stages, with cavities, a large blood-vessel may rupture and the hemorrhage be fatal. It is well to have the patient lie on the side which is bleeding. This tends to prevent the blood from flowing into the bronchi of the other lung.

Besides reassuring the patient, it is often well, if there is a troublesome, irritating cough, to administer a hypodermic of morphin in just sufficient dose to quiet the irritability of the bronchial tubes and larynx so that the cough will be only sufficient for expectoration. (It is unnecessary to give a large dose which later will cause prostration; hence from 1/10 to 1/8 of a grain will be sufficient.)

The more rest the bleeding part has, the quicker will the blood coagulate in the bleeding vessels, but as above stated, mere capillary oozing should not be taken

seriously. With a real hemorrhage from the lungs, the rest must be absolute; the patient should not even speak, at least not above a whisper. For some hours he should receive no food or drink. It is exceedingly doubtful if an ice-bag over the region of the bleeding is at all efficacious. The long-used remedy of eating salt may reflexly, by irritation, increase the vasomotor tension and thus may occasionally stop a hemorrhage, but most of the remedies used and said to be satisfactory in hemorrhage from the lungs are drugs that increase the blood-pressure more or less, which is undesirable. As the blood-pressure is lowered, the hemorrhage will generally cease, usually without medication, so that whatever has been given has been supposed to be the cause of such cessation. If the patient becomes faint, blood-pressure is lowered, coagulation in the open vessel or vessels takes place, and the unpleasant symptom is cured by Nature's methods; therefore we should aid the natural cure of the condition by giving the patient nitroglycerin to lower the blood-pressure. Amyl nitrite is very frequently advised, but its action is so sudden, and for a few minutes so intensely disagreeable, that it is hardly advisable to use this powerful drug. Nitroglycerin on the tongue or hypodermatically will act as efficiently and almost as rapidly without causing the faintness and throbbing head that amyl nitrite will cause. It is a mistake to give ergot, caffein, suprarenal preparations, or digitalis, as these tend to increase the heart activity and raise the blood-pressure.

If there is a tendency to repeated, more or less serious hemorrhages, the daily administration of calcium in some form, either as lime-water or calcium lactate, and the feeding of gelatin are indicated. Also, if there seems to be a general tendency to the oozing of blood and to hemorrhage, injections of aseptic horse-serum is advisable; one or two subcutaneous injections will generally be sufficient. Inhalations of steam impregnated with some astringent such as tannic acid may be of value, if there is oozing of blood from the larger bronchial tubes, but such inhalations are of no value in bleeding from deeper portions of the lungs, as the astringent could not reach the region of trouble.

The patient should generally remain in bed for a week after a real hemorrhage. If the heart is impaired and some dilatation exists, if the expectorated blood is venous, and there are other signs of passive congestion of the lungs and of cardiac weakness, digitalis may be the best treatment for the condition; but for ordinary hemorrhages in pulmonary tuberculosis it is better, as above stated, to administer nitroglycerin in sufficient amount to distinctly lower the blood-pressure temporarily.

It has been repeatedly noted that constipation increases the tendency to hemorrhage in pulmonary tuberculosis, and that the higher blood-pressure caused by constipation is readily lowered by the administration of even simple laxatives. Consequently in pulmonary tuberculosis the patient should not be allowed to become very constipated.

If the hemoptysis occurs late in the disease and is dangerous in amount, the patient may quickly succumb, whatever the treatment adopted. A most efficient treatment of this serious condition is to place elastic bandages high up on the legs, or even on all the extremities, to shut off their blood from the general circulation. It would be inadvisable, even if the hemorrhage was severe, to transfuse immediately, as anything that raises the blood-pressure will be likely to cause a return of the hemorrhage from the open vessel. Later, after the hemorrhage has ceased and sufficient time for thorough coagulation has passed, the bandages of the extremities, one at a time, may be released and the blood allowed to return to the general circulation.

Continued bleeding from the lungs (especially when cavities exist and a serious hemorrhage has taken place, or seems likely to occur) is one of the most important indications for the use of lung compression. Other indications, as previously suggested, are the presence of pus in a cavity in the lungs, and bronchiectasis. It is also wise, perhaps, to compress a lung when, in spite of some weeks of proper treatment, the disease continues to spread in it, the other lung being normal.



The gases that may be injected into the pleural cavity are nitrogen, oxygen and nitrogen, oxygen and air, or air and nitrogen. If only temporary compression is desirable, air, or a gas rich in oxygen seems indicated, as its absorption is more rapid. If a prolonged compression is desired, nitrogen should be used, as it is less readily absorbed, and therefore the compression is longer continued. A mixture of air and nitrogen is perhaps a good combination when a brief compression is desired, and being more rapidly absorbed than nitrogen, will allow a decision as to the ability of the patient to stand this compression before using the longer compression by nitrogen. It has also been urged that air compression is safer than by nitrogen from the fact that if gas bubbles enter the circulation, the air bubble is more quickly absorbed than the nitrogen bubble. Good technic with proper instruments, however, should preclude such an accident.

If compression is once done and its continuance is desired, more gas should be injected before all of that previously injected is absorbed, as after an injection has once been made, and the pleural surfaces have come together, they become more or less adherent and it is difficult to inject the gas again into this pleural cavity.

*Night-Sweats.*—This debilitating symptom is very characteristic of tuberculosis, and may occur even without much afternoon or evening fever; generally, however, it follows such increase of temperature. Therefore, the rest and fresh-air treatment that prevents a rise in temperature will also ameliorate or prevent the night-sweats. If, however, typical cold night-sweats occur, nothing in the way of medication more successfully prevents them than atropin,  $1/200$  to  $1/100$  of a grain, given, dry on the tongue, at bedtime. The hydrotherapeutic measures already advised, that is, the warm water, and later cold water morning spongings are of value as preventives. If the patient is at rest and is getting no exercise, good massage followed by an alcohol rub is an excellent method of stimulating a more healthy circulation in the skin and muscles, and of diminishing the tendency to profuse perspiration. The avoidance of constipation, a healthy

circulation and good activity of the kidneys, all prevent night-sweats and the accumulation of toxins in the blood. If there is much circulatory weakness, several doses of strychnin sulphate a day, or digitalis, may also prevent night-sweats.

*Diarrhea.*—Simple diarrhea occurring in tuberculosis patients generally means either that the patient gets chilled, or that the diet is incorrect. Correction of these conditions will soon stop such diarrhea. Tuberculous diarrhea, i. e., a diarrhea due to tuberculous disease of the intestine is a serious complication not only of pulmonary tuberculosis, but also of any other form. It often occurs in the last stage of the disease. Rest in bed and a carefully selected diet is the treatment. Whether the diet consists of milk alone, or of a little meat and eggs with milk, should depend on the patient. Generally, vegetables and fruit should be temporarily withheld, and the cereal foods diminished in amount.

Bismuth subcarbonate may stop the diarrhea, but bismuth should not be long continued. Lime-water may be of benefit. If the kidneys are normal and there is no albuminuria, phenyl salicylate (salol) is good treatment. At times, one of the creosote combinations is valuable. The administration of opium in some form may be necessary before diarrhea can be checked, and in the last stages of tuberculosis diarrhea may not be prevented. Colon washing with warm physiologic saline solutions is sometimes markedly sedative and of value. The bowels should always be kept especially warm, and the patient with diarrhea should not be subjected to intense cold.

*Dyspnea.*—If the patient is in the last stages of pulmonary tuberculosis and must soon die, there is no excuse for not preventing the air-hunger, and morphin administered in properly selected, small doses will often relieve the dyspnea.

*The Pneumonic Type of Pulmonary Tuberculosis.*—Such a condition is likely to occur as a part of acute miliary tuberculosis, but it may develop in a lung as an acute exacerbation of a chronic tuberculosis. The disturbance may be ushered in with a chill, high, irregular temperature, frequent, short cough, considerable

dyspnea, at first without physical signs of gross consolidation, but later showing in a part of a lobe, or even the whole lobe, the usual pneumonic signs, even with rusty sputum. The rusty expectoration soon disappears, however, and yellowish, greenish sputum, perhaps blood-streaked and loaded with tubercle bacilli, occurs. The prognosis is very serious, but the acute exacerbation may cease. The treatment is not dissimilar from that of an ordinary pneumonia.

*Laryngeal Tuberculosis.*—The prognosis of this condition has, up to recent years, been considered very bad indeed, but with more skilful treatment by throat specialists, with the added rest-cure and with tuberculin treatment, many such cases are aborted and the lives of the patients saved. The instances of tuberculosis of the larynx are rare in which, preceding or subsequent to the beginning of the laryngeal disease, some portion of the lungs will not be found affected.

The exact local treatment of a tuberculous larynx depends, of course, on the location of the ulcer or ulcers. If they are so situated that swallowing is very painful, anesthetizing sedatives must be used. Various preparations of silver, lactic acid and menthol are used by different clinicians to aid in healing the ulcers, but the tuberculin treatment, properly used, is probably generally advisable.

*Tuberculous Peritonitis.*—This condition uncomplicated with tuberculosis elsewhere must, of course, be differentiated from many abdominal conditions. If there is fluid, other causes of ascites, as inflammation of the liver, serious cardiac insufficiency and ovarian cysts must be excluded. Tuberculous peritonitis may appear in several forms: the miliary form which causes ascites, the fibrocaseous, the fibro-adhesive and that which causes tumor masses. The range of temperature (although in chronic tuberculous peritonitis there may be no increase of temperature, and it may even be subnormal), the localized tumor masses and fluid confined to one portion of the abdominal cavity by adhesions, will aid in the diagnosis. In tuberculous peritonitis there may be more fluid on the left side of the abdomen than on the right, as the diseased mesentery retracts and draws the bowel to the right. As

frequently tuberculosis is not present in other organs, the diagnosis is often difficult, and a tuberculin test is indicated. The fluid in the abdomen in tuberculous peritonitis does not contain pus, unless there is a mixed infection, as the tubercle bacillus does not produce pus. The drawn serum very frequently does not show tubercle bacilli, but a guinea-pig inoculated with the serum will, in due time, develop tuberculosis, if that is the infection from which the patient is suffering. If the exudate found on laparotomy or withdrawn for examination is bloody, it shows the disease is active. Tuberculous peritonitis may originate from infected mesenteric glands. Much false membrane is formed, which causes many adhesions of the intestines.

A patient may apparently be very well and still suffer from tuberculous peritonitis, and the prognosis is rather favorable if such a patient is operated on. It is not advisable to operate for tuberculous peritonitis if tuberculous infiltration is already in the lungs. At times, withdrawal of fluid from the abdomen by aspiration, tonic treatment, rest and the exposure of the abdomen to the rays of the sun will cause a cure. Many sanatoriums are installing the necessary equipment for giving heliotherapy, or sun baths. The direct rays of the sun are thrown on the chest or abdomen. The electrochemical action of the roentgen ray has also been tried, but its value has not been well proved.

If the ascites tends to recur, or remains, laparotomy should be done, and sunlight let into the abdomen. Laparotomy may cure tuberculous peritonitis when there are simply tuberculous masses or tumors, but no fluid in the abdomen. It has been thought that small doses of mercury administered for a long period, especially in the form of corrosive sublimate, was of advantage in tuberculous peritonitis.

The results of operation may be summed up about as follows: There is slight danger from the operation itself. Temporary improvement may almost always be expected. Fatal cases usually terminate in a few months after the operation; while not far from one-third of all cases seem to recover in about one to two years after the operation. Antiseptic injections or continuous drainage after operation are not indicated and are useless.



*Tuberculosis of the Genito-Urinary Tract.*—Tuberculosis of the bladder and prostate is rarely primary, and often has gonorrhea as an antecedent. Tuberculosis of the testicle is by no means infrequent. Removal of the testicle is of course advisable, and operative interference in the bladder and prostate may be indicated. A tuberculous kidney should be removed as soon as it is diagnosed provided the other kidney is normal. The general treatment is the same as in all tuberculosis.

*Tuberculosis of the Cervical Glands.*—Although this subject has already been quite largely discussed, it should be urged that while surgical removal is necessary and very frequently indicated, every gland that is needlessly removed weakens by just so much the ability of the system to protect itself against all infections. Roentgen-ray treatment, while lauded by some men, seems unsatisfactory to many clinicians. While infected or broken-down glands are being removed, the dissection should be very carefully done, lest the surrounding parts be infected with liberated germs, or if not locally infected, lest the bacilli be absorbed into the lymph circulation and cause general infection.

While a gland should not be removed merely because it is enlarged, at the same time it is a serious mistake to allow enlarged glands to cause such inflammation of the surrounding tissues as to render it necessary to remove parts of muscles, to say nothing of the danger of such chronic inflammation necessitating, during operation, injury to important blood vessels and nerves. Glands should be removed before they cause injury to the patient or the surrounding tissues. Infected tonsils and infected teeth should be removed before the lymphatic glands or other parts of the body become infected.

The tuberculin treatment of tuberculosis of the glands, especially in children, is much in vogue, and if the tuberculin is used in carefully graded doses the results seem to be satisfactory. Caseated glands should be eradicated or curetted, however, as the tuberculin treatment will not cause resorption. Also, the exact value of the tuberculin treatment for tuberculous glands cannot be determined, as fresh air, good

food, iron tonics, and medical supervision are active aids in the cure of this condition. Too large doses of tuberculin may overstimulate the diseased glands and cause general infection. Also, one does not know how many concealed diseased bronchial glands will be stimulated by the tuberculin injections; hence a very careful study of focal reaction should be made throughout the treatment. Bier's hyperemic treatment is probably inexcusable.

*Bone and Joint Tuberculosis.*—In tuberculosis of these parts of the body, according to Fiske, there may be a slight leukocytosis of not far from 12,000, while in osteomyelitis the leukocytosis is generally not far from 16,000. Children who have bone tuberculosis frequently do well at sanatoriums or in hospitals especially arranged for their out-door or veranda treatment. They do especially well at the seashore, and direct sunshine makes a valuable addition to the treatment of this kind of tuberculosis. Tuberculosis of the glands and bone and joint tuberculosis do especially well under treatment by sun baths, both general and local, in combination with the invigorating effects of cold at moderately high altitudes. Rollier of Leysin and other practitioners at sanatoria in the Alps and at a few places in the United States have secured particularly good results by this form of treatment. Such treatment can be given at home by the institution of simple arrangements at first in the patient's room, later on a veranda and finally when the surgical condition will permit, by free movement in the open air.

*Tuberculous Meningitis.*—Meyers (*Amer. Jour. Dis. Child.*, May, 1915) classified the etiologic factors, symptoms and signs of 105 patients with tuberculous meningitis. Meyers found that 38 per cent. of these children had had no previous diseases; in the remaining 62 per cent. measles had occurred more frequently than any other disease. The average duration of the disease from the time of the beginning of symptoms was seventeen days. Meyers thinks the disease is not so rapidly fatal as it once was on account of lumbar puncture being now more frequently done, thus preventing early deaths from cerebral pressure.

Lumbar punctures were done from once to seven times to a single patient. He finds that lumbar puncture prevents convulsions, which become rare in the clinical history of the disease thus treated. Meyers believes that the advantage of lumbar puncture is not only in relieving pressure, but also in eliminating a certain amount of toxin. He has not found unpleasant symptoms to occur from the withdrawal of even a considerable amount of spinal fluid, even though it was not under high pressure.

The rule of Meyers is to allow the spinal fluid to drain until it runs at the rate of from 10 to 12 drops per minute, and to draw off from 20 to 30 c.c. of fluid, depending on the pressure. Eighty per cent. of the cases showed increased pressure but varying, of course, in degree. If the child lived, lumbar puncture was done once every forty-eight hours. If the fluid removed at the first puncture did not show the organism causing the meningitis, the later punctures usually did, and tubercle bacilli were found in 21.5 per cent. of these 105 cases of tuberculous meningitis.

When there was no increase of pressure in the cerebrospinal canal, there were almost no disturbances of the reflexes, and there seemed to be no relation between the amount of pressure and the presence of convulsions, bulging fontanel or retraction of the head. The fluid of this disease was never found really turbid, and was generally absolutely clear. The cell count of the fluid varied from 24 to 960 per cubic millimeter, with an average of 198. This cerebrospinal fluid cell count seems to vary with the leukocyte count of the blood: the greater the leukocyte count, the greater the number of cells in the spinal fluid. The prevailing type of cell in the spinal fluid was the small mononuclear, ranging from 90 to 100 per cent. in 67 per cent. of the cases, and from 80 to 90 per cent. in 20 per cent. of the cases. A fibrin clot was found in 70 per cent. of the cases, and a positive globulin test in about 50 per cent. The globulin content seems to vary directly with the cell count. The first part of the spinal fluid withdrawn at each puncture has a different cellular content from the last part that is withdrawn, the first part giving the greater number of cells.

One fourth of the cases showed a leukocyte count of the blood between 10,000 and 15,000; the lowest count was 8,500, and the highest 48,000. Absence of eosinophils, as in some other diseases, is considered an unfavorable symptom.

In those tested for the von Pirquet reaction, 63 per cent. were positive.

Twenty-five per cent. of the cases gave a history of definite exposure to tuberculosis. Thirty per cent. of the cases showed lung involvement, and had more or less cough. In 71 per cent. the eye reflexes were abnormal, but in 29 per cent. the pupils were equal, and reacted normally to light. Thirty per cent. showed normal patellar reflexes, and in 21 per cent. the reflexes were absent. There was a positive Babinski in 21 per cent. Fifty per cent. of the cases gave the Oppenheim sign. Ankle clonus was rarely present. Kernig's sign was present in 27 per cent. of the cases. Forty-three per cent. showed some signs of paralysis, with strabismus as the most frequent form. Seventy per cent. showed some rigidity of the neck, and, late in the disease, there was definite stiffening of the limbs.

While 39 per cent. of the patients had a history of convulsions before entering the hospital, as stated above, spinal puncture seemed to relieve or prevent convulsions. The subjective symptoms were drowsiness, indifference, and sometimes irritability. Eighty-five per cent. had vomiting as an initial symptom. This vomiting had no relation to the food taken, and in no case was there projectile vomiting as is so frequently seen in meningococcic meningitis. Pain was a frequent symptom.

In 18 per cent. of the cases the urine showed acetone, and sometimes slight traces of albumin.

Before death, pulse, temperature and respiration in about half of the cases became higher. Early in the disease the pulse was slow and irregular; later in the disease it became soft and rapid. In 64 per cent. of the cases there was a remission, with a drop of pulse and temperature; but this was apparently not a sign of improvement. Also, a patient, who may have been comatose, may brighten up and answer questions from



twenty-four to thirty-six hours before death. Forty-two per cent. of the cases showed terminal bronchial pneumonia.

In no case in this series was there recovery. The treatment tried was sodium benzoate in large doses, and inunctions of mercury. Hexamethylenamin was used in large doses, but even with these large doses there was never a trace of formaldehyd found in the spinal fluid. This seems again to disprove the value of this drug in cerebrospinal inflammations.

Enough cases are now on record to show that recovery from tuberculous meningitis is possible, so that the prognosis is not absolutely hopeless, although very dire. If the child is suffering pain, codein or some form of opium should be administered in doses found sufficient for the individual, but not large enough or so frequently repeated as to produce coma; that is, if coma occurs it should be known that it is caused by the disease and not by the drug. The little patient, however, should not be compelled to suffer severe pain. Even if food is refused, the child will generally drink milk.

*Acute Miliary Tuberculosis.*—This occurs in several forms; one in which all the organs of the body are attacked, others in which only certain organs are diseased. In another form the tubercles may be larger and show degeneration. The disease is always serious, generally fatal, and clinically occurs in the meningeal form just described or as a general acute bronchopneumonia of both lungs, or as the typhoid type. In the lung form the sputum is loaded with tubercle bacilli and the diagnosis is readily made. In the typhoid form there may be no cough, and no real lung signs, although lesions may be found in the lungs on necropsy. It may be difficult at first to distinguish this form from typhoid fever, but the temperature is likely to be very high in the evening with considerable of a drop in the morning, and there are profuse sweatings. Such morning remissions occur early in the disease, thus differing from typhoid fever. The pain and tenderness in the abdomen, and the point and cerebral symptoms, will soon make the diagnosis positive. Diarrhea generally does not occur with acute miliary tuber-

culosis; in fact, the patient is generally constipated—another symptom different from most cases of typhoid fever.

The treatment is similar to that of any acute infection with the exception that great care should be exercised to sterilize every excretion from the body.

*Tuberculous Arthritis.*—Cases occur of pain and swelling of the joints due either to the circulation of tuberculous toxins in the blood or to the presence of a small number of tubercle bacilli in the affected joints. It is probable that a considerable number of cases of ordinary rheumatism are due to tuberculosis. An almost positive sign of such cases is the occurrence of focal reactions (pain and swelling) in the joints after injection of old tuberculin subcutaneously.

#### PROGNOSIS

In the first place, as to the probability of cure of tuberculosis, it should be remembered that statistics of necropsies show that from 30 to 35 per cent. or more of patients who have died from causes other than tuberculosis show evidence of that disease, either healed or latent. In general, the prognosis of pulmonary tuberculosis is modified by the family history, by the causes which have allowed the tuberculosis to develop, by the whole general condition of the patient, and by the amount of lung tissue involved. A tuberculous process that begins in the lower part of the lung, following a pneumonia, gives a bad prognosis. A generally debilitated and anemic condition will necessarily slow or preclude a cure. An associated laryngeal or intestinal complication makes the prognosis very serious.

When a patient is first seen, the prognosis should be guarded, as it is only after weeks or months that the decision can be made as to how much this patient may improve, as even a person who looks otherwise well, except for the fact that tuberculosis is discovered, may develop an acute form of the disease. The physician should individualize the patient, not only as to his surroundings and his occupation, but also as to his mentality. His disposition should be studied. It is a

mistake to send to a sanatorium a patient who will be restless under sanatorium restrictions, or who will be so seriously homesick as to lose his appetite, or who will not at all obey instructions. Therefore, the mentality, the individuality and the willingness to cooperate of the patient is of great importance in the prognosis.

According to Combe (*Le Nourrisson*, 1916, 4, 202), the opinions of pediatricians differ as to the prognosis of tuberculosis in infants. While most declare that, when diagnosed clinically it is absolutely fatal, others affirm that they have seen infants survive tuberculous disease. Combe is of the opinion that the prognosis of tuberculosis in infants is very grave, but not inevitably fatal. He thinks the outcome depends on a number of factors. The age of the child at the time of infection is the first point to consider. The younger the child is at this time, the less capable he is of defending himself and the greater is the tendency of the tuberculosis to become generalized. The virulence of infection and the opportunity for reinfection are important factors. Contact with open tuberculosis offers this opportunity for reinfection. It is usually admitted that infection from the mother is more dangerous than that from other members of the family, and that the danger is the result of reinfection.

The clinical form of the disease is most important in prognosis. If when the diagnosis is made the tuberculosis is still localized in the glands, a less serious prognosis can be given. If the glandular barrier is broken down and there is mediastinal and hilus infiltration, the case must be regarded as very serious, although the author affirms that he has seen symptoms recede and apparent recovery result from tuberculin therapy. If signs of generalized tuberculosis are present and the roentgen ray confirms the diagnosis of miliary tuberculosis or of acute caseous pneumonia, the case must be regarded as desperate. Chronic surgical tuberculosis is the only form which offers a good prognosis. This is caused by a spontaneous auto-tuberculin therapy from the slow progressive penetration of tuberculin into the general circulation.

It is a question whether asthma, which was long supposed to protect against tuberculosis, really does so. Certainly an asthmatic patient may have tuberculosis. It seems to be a fact that persons who suffer from heart-disease, especially if there is a sufficient loss of compensation to cause more or less dyspnea and pulmonary passive congestion, do not have tuberculosis so readily. This subaeration may interfere with the growth of tubercle bacilli.

Tuberculosis of the cervical lymph-nodes may be due to an auto-infection. In other words, bacilli may be contained in the patient's own sputum, infect the tonsils and be from there carried to the cervical glands.

A more or less continuously rapid pulse gives a bad prognosis. A temperature that is not greatly lowered by rest gives a bad prognosis. Of course, the case is serious as long as there is a morning fever. A patient whose temperature is normal or subnormal in the morning, even if there is considerable rise in the afternoon and evening, may not only improve, but may recover. Any sexual excess, and even any sexual act during tuberculosis will aggravate the condition. A slight gain in weight, while desired and looked for, and generally an indication that the patient is improving, is not necessarily a positive indication that the prognosis is absolutely good, as many instances occur in which the patient gains weight for a time, under proper treatment, but the disease progresses. Therefore, a slight but steady gain in weight should be considered satisfactory, but should not cause too favorable an opinion of the outcome to be given.

It is considered a good prognosis when the lymphocytes in the blood are increased in number, showing that the nutrition is improving. It has also been considered that a normal number of eosinophils gives a good prognosis, while an absence of eosinophils gives a bad prognosis. Whatever the condition, however, it should constantly be borne in mind that pulmonary tuberculosis is curable in the first and second stages, and a cure may even take place in the third stage, or when there are cavities.

Pregnancy in a tuberculous patient makes the prognosis bad, and should call for a consultation to decide as to whether or not abortion should be produced.



## ARRESTED TUBERCULOSIS

A patient who has even a temporary return to health must generally go to work, and the question of vital importance is, What shall the work be? There is no light outdoor work suitable for such recovered patients; hence, unless the occupation is one that is a menace to his health, a patient should return to his previous work. The education received during his cure should have taught him how to live to keep his health. The next important rule for him to follow is to return to his physician for observation and advice at frequent intervals.

# DISEASES OF THE RESPIRATORY TRACT

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## COMMON COLDS

Colds far surpass in frequency any other disease condition. There is no immunity acquired by surviving a coryza, a pharyngitis or a bronchitis; in fact, ordinarily, the person is at least temporarily more susceptible to taking or developing a fresh cold. This may not be quite true of an influenza or grip cold, because many persons have a real or pseudogrip attack early in the fall or winter and are then more or less immune from acute attacks during the rest of that season. Besides the immediate debility that an acute cold causes, the possibility of opening the way for the entrance of more serious disease should cause every cold to be considered seriously and treated energetically.

Acute colds are always due to germs of some kind. A too dry atmosphere, which is the condition in so many houses today, may so irritate or congest the nostrils as to allow the least irritant to cause at first a simple inflammation of the mucous membrane, which congested area may later pick up and harbor, or cease to kill, germs. Outdoor air does not predispose to colds as much as indoor air, and persons whose occupation is indoors are more liable to have colds than those whose occupation is outdoors. Chilling, whether indoors or outdoors, certainly predisposes to colds. It is quite probable that chilling of the surface of the body congests the inner organs and possibly the mucous membranes of the air passages. If the mucous membrane of the nose is congested, it more readily becomes inflamed.

Acute nasal inflammation, often called a "cold in the head," is of frequent occurrence in some regions, especially near the seacoast, and occurs repeatedly in certain persons who seem to have a susceptibility to inflammation in the nose. Some persons cannot be exposed to a single draft on any part of the body without an acute coryza starting. It is supposable, however, that while most acute nasal inflammations

are due to infectious germs, more or less chronically hypertrophied mucous membrane and more or less sluggish circulation in this membrane may allow simple noninfectious inflammations to occur when irritation of any kind is applied. Other persons who do not have this susceptibility may become chilled, may be subjected to violent cold, damp winds, and may even get wet and still never develop a nasal inflammation. Just as large tonsils more readily catch germs and become diseased, or more readily harbor germs and have recurrent inflammations, so hypertrophied mucous membrane of the nostrils becomes susceptible to reinfection or to reirritation. Frequent acute colds, more or less constant subacute inflammations, or chronic inflammation may result from such a condition.

#### BACTERIOLOGY

Tunnickliff (*Jour. Infect. Dis.*, 1913, 13, p. 283) in the acute and chronic forms of rhinitis, isolated an anaerobic gram-negative bacillus, which she named the *Bacillus rhinitis*. Kruse, (*München. med. Wchnschr.*, 1914, 61, p. 1547) working along the same lines, was able to demonstrate that when the secretions from the discharge in cases of acute rhinitis were taken and diluted even as much as twenty times, and then filtered, the filtrate inoculated into the noses of healthy people produced typical cases of acute rhinitis. As a result of this he concluded that the acute rhinitis was caused by an invisible and filterable virus, since the filtrate when cultured remained sterile.

Foster, (*Jour. A. M. A.*, April 15, 1916, p. 1180) repeated Kruse's experiments and obtained similar results. He, however, went further, and using Noguchi's method for growing the parasite of rabies and the organism of poliomyelitis, was able to obtain from the filtrate an organism which, when inoculated into the noses of seven soldiers, produced a typical condition of acute rhinitis in all of them.

#### PROPHYLAXIS

The preventive measures consist of proper bathing to keep the skin in good condition; proper clothing, depending on the region, season and exposure; proper

heating and ventilation of living rooms, bedrooms and buildings in which persons are employed, and in the case of the child, proper heating and ventilation of the schoolrooms. Too severe exposure of young children and babies to dampness and winds is inexcusable and does not increase their resistance against catching cold, and often precipitates more serious conditions. Any person who has a tendency to nasal or pharyngeal colds should not suffer undue exposure at night. Too many windows being open may cause too much direct draft over the face. Fresh air sleeping should be governed by common sense. Cold daily sponging of the child's face, neck and chest, followed by quick friction, is a splendid means of decreasing the likelihood of catching cold or becoming chilled. Older persons may take cold showers or cold plunges in the morning, if it is advisable in individual cases.

Children especially should not be subjected to unnecessary infection by being taken into crowded cars, stores or into assemblages, where it is impracticable to avoid close contact with coughing or sneezing persons who do not properly protect the surrounding atmosphere by using handkerchiefs.

As so many times urged, a child or adult who has repeated colds should be examined and properly treated medically or surgically by a nose and throat specialist. The family should also be taught that the exchange of handkerchiefs and the use of the same towels when one member of the family has a cold or sore throat is inexcusable. Direct contagion by this method is probably very frequent. During all colds the nasal and throat secretions or excretions should be received into paper handkerchiefs, or pieces of cheesecloth, and either immediately burned or deposited in a paper bag for burning later. If handkerchiefs are used, they should be washed separately and soon.

A too dry indoor atmosphere can harm the mucous membranes of the upper air passages as it leaves the membranes unprotected, and the first irritant that attacks them may cause an inflammation.



## TREATMENT

Acute coryza having begun, an attempt should be made to abort it. There are various methods of relieving internal congestions, and the general principles are the same in all cases, wherever the localized inflammation may be. These general methods are some means to reduce an increased temperature, some means of bringing the blood to the surface of the body and increasing perspiration, some means to produce free catharsis and thus to deplete the blood-vessels and lower the blood-pressure to relieve indirectly the tension in the region of congestion, and some means to prevent the development of the second stage, or stage of secretion, if possible. Methods used to meet one of these indications will many times meet one or more of the others; hence the treatment is often very simple.

If the patient is first seen in the morning, or before the middle of the afternoon, the best treatment is a saline purge of some description, as exemplified by the Seidlitz powder or by the effervescing magnesium citrate or Rochelle salt, or castor oil if that is preferred. If the patient is seen first in the evening, a less quickly acting cathartic is advisable. A single dose of the aromatic fluidextract of cascara sagrada, U. S. P., may be given at bedtime. The dose may vary from 4 c.c. for a child of 3 to 5 years of age to from 4 to 16 c.c. for an adult. More active purgation may be secured with calomel, or with an aloin pill. The old-fashioned Dover's powder is still given by many physicians and often works well, but may cause considerable nausea. Also, opium, or morphin in any form tends to inhibit free action of the bowels, which is undesirable. One of the best treatments is one of the coaltar products, such as antipyrin, acetanilid or acetphenetidinum. Any one of these may be given in one fair-sized dose or in two medium-sized doses, or in several small doses. One gm. of antipyrin would be a full dose; 0.50 gm., repeated in five or six hours, would be a medium dose; 0.30 gm. of acetanilid would be a large dose, and 0.10 gm. might be repeated at three-hour intervals for three times. A satisfactory method

is a combination of acetanilid with sodium bicarbonate, and a prescription similar to the following is often very valuable:

	Gm.		
R Acetanilidi .....	0 25	or	gr. v
Sodii bicarbonatis.....	2 50		gr. xl

M. et fac chartulas 5.

Sig.: One powder every two or three hours.

A similar combination may be given in tablets, if preferred. It should be remembered that caffein has been shown not to protect the heart from depression caused by large doses of a coal-tar product; therefore, there is no object in adding caffein to such a prescription. When these coal-tar products are ordered, it is well to give coincidentally hot lemonade. Perspiration is more readily caused by this means.

Provided the patient is not soon to be subjected to exposure, a hot bath is another efficient means of relieving internal congestions, and can be used coincidentally with the other treatment. Acidum acetylsalicylicum (aspirin) is now more largely used than almost any other drug to abort colds. The laity, on account of the instructions which they have received of the dangers of acetanilid and similar drugs, now all buy and use this drug with too great freedom.

Rhinitis tablets are sold everywhere to the laity, and are largely used by physicians. These are various combinations of morphin, atropin, strychnin and aconitin. The minute dose of aconitin probably generally has no action. If one desires the activity of aconite, it is best to give it in a tangible form and dosage, namely, the tincture of aconite, a drop perhaps every half hour or hour, until the pulse shows the activity of the drug. However, this treatment ordinarily requires that the patient be seen within a certain number of hours by the physician, to ascertain whether or not the aconite should be stopped, unless the doses are limited in number. The old aconite treatment of colds has mostly given place to the newer treatments described above. The whole rhinitis tablet combination probably represents principally the action of atropin with some help from the morphin, both of which will dry up the secretions of the nostrils and throat. The small amount of strychnin probably is

not very active. Sometimes minute doses of quinin enter into these combinations, but that probably is not active. In other words, a small dose of atropin sulphate, given frequently, acts as well as one of these rhinitis combinations.

There is no question about the drying up of secretions by morphin, if this drug is pushed. Rarely is such treatment needed.

Quinin sulphate has been used for years as an abortive treatment of colds, and the laity, until more recently adopting acetylsalicylic acid, have always resorted to this drug. Small doses would probably not have any very decided action; large doses are inadvisable at this stage of the cold because of the tendency to congest the middle ear.

Spraying or snuffing solutions into the nostrils at this stage is inadvisable. The throat may be gargled with warm physiologic saline solution, which is roughly represented by  $\frac{1}{4}$  teaspoonful of salt to half a glass of warm water. If the patient has been known to be exposed to some acute throat or nasal infection, more active antiseptic gargles and sprays may be used; but an acute coryza will rarely be aborted by local treatment.

If the inflammation is not aborted and the second stage develops, that of profuse mucus and some mucopurulent discharge, then cleansing of the nose and throat becomes urgently needed. At this stage all of the foregoing abortive measures should cease. A patient who has been more or less deprived of food, except a small amount of liquid nourishment for from twenty-four to thirty-six hours, may now resume his normal diet.

The more or less purulent discharge from the nostrils should not be allowed to remain blocking up the passages. Consequently, atomizing with warm saline and alkaline solutions should be more or less frequently done. Various compound solutions or tablets for solution are offered, but there probably is no advantage in these combinations over more simple ones. The simplest cleansing solution is one made from  $\frac{1}{2}$  teaspoonful of salt and  $\frac{1}{2}$  teaspoonful of sodium bicarbonate to a glass of warm water, or half these amounts for half a glass of water. To be properly soothing, the

solution should always be warmed. The same solution may be used as a gargle. If a mild antiseptic is needed, saturated solutions of boric acid or borax are efficient. If stronger antiseptic solutions are required or advisable, hydrogen peroxide is valuable, as 1 part of the official aqua hydrogenii dioxidi to 4 or 5 parts of warm water for a gargle, or 1 part to 7 or 8 parts of warm water for a nasal spray. Nasal spraying and proper cleansing of the nose protects the adjacent sinuses from infection.

Cleansing the nasopharynx by snuffing back a solution from a teaspoon or a small vial, or snuffing back a spray, or gargling and then throwing the head forward and washing the nasopharynx, protects the eustachian tubes from infection. Two cautions should be suggested: first, that douching of the nasal passages should not be done with the nostril blocked, or with a high placed douche reservoir, as the pressure is likely to be sufficient to send fluid into the eustachian tubes or into the sinuses, and cause inflammation of such parts. Most of the patented douche apparatus are inadvisable. The second precaution is that it is not well to cleanse the mucous membrane of the nostrils too thoroughly of mucus before the patient goes into the outside air, especially if that air is dust-laden. The proper time to spray is when the patient is to remain in the house for a short time; or if he is sprayed and then must go out of doors, he may receive a non-irritant oil spray to furnish coating for the mucous membrane, this is to be used after the alkaline spray. Or small plugs of cotton may be placed in the nostrils.

It may be well at this time to use a camphor-menthol oil mixture either as drops or as a spray. The following may be suggested:

	Gm. or C.c.
R Menthol .....	25
Camphor .....	5
Liq. petrolatum.....	50

If the secretion from the nose is tenacious and hard to dislodge by blowing the nostrils, ammonium chlorid may be a drug of value. It has been used as a stimulant to the upper air passage mucous membrane as well as to the bronchial mucous membrane. It may be given in a simple preparation as:



	Gm. or C.c.	
R Ammonii chloridi.....	5	3 iss
Syrupi acidi citrici.....	25	or fl 3 i
Aquae .....q. s. ad	100	fl 3 iv

M. Sig.: A teaspoonful, in water, every three hours.

If the coryza tends to become subacute and prolonged, tonic treatment is required; a small dose of quinin and a small dose of iron, with or without arsenic and strychnin, are advisable. The following tonic capsule may be used, and the doses may be modified for a child:

	Gm.	
R Arseni trioxidi.....	0 04	
Strychninae sulphatis.....	0 04	āā gr. $\frac{2}{3}$
Ferri reducti.....	1 0	or gr. xv
Quininae sulphatis.....	2 0	gr. xxx

M. et fac capsulas siccas 20.

Sig.: A capsule three times a day, after meals.

Spraying with suprarenal solutions is often of advantage, but sometimes is followed by more congestion. Some nose and throat specialists use suprarenal preparations constantly. Such treatment certainly many times is efficient in temporarily relieving congestion and giving comfort.

This discussion of the treatment of common colds would not be complete without reference to the vaccine treatment. While the exact value of such treatment has not been determined as an abortive treatment or as a treatment that shortens the course of the disease, the enthusiastic recommendation of such treatment by some writers should be recognized. The large majority find no value in vaccines either for prophylactic or curative purposes. When there is sinus infection, auto-genous vaccines would seem indicated.

## ACUTE PHARYNGITIS

The abortive treatment of this inflammation is the same as that described for acute colds.

With a simple pharyngitis, soothing alkaline gargles, as previously described, should be the treatment. A very simple, pleasant and efficient gargle is as follows:

	Gm. or C.c.	
R Acidi borici.....	2	3 ss
Potassii chloratis.....	2	or 3 iss
Aquae menthae piperitae...	200	fl 3 vii

M. Sig.: Use as a gargle, every three hours, diluted with equal part of warm water.

## COUGHS

### DEFINITION

Coughing is an expiratory effort caused reflexly by some irritation. The muscles of the lower part of the chest are most engaged in the act of coughing; hence in severe, prolonged or frequent coughing muscle tire occurs in the lower part of the chest, both anteriorly and posteriorly. The abdominal muscles all take part in this expiratory effort, and the erector spinae muscles, the serratus, and the quadratus lumborum are all utilized in a strong expiratory cough. The muscle contractions compress in all directions the lower part of the chest, and the air in the bronchial tubes is forced upward, and, if there is no obstruction, is expelled through the glottis. If there is obstruction, or even partial obstruction, the upper portion of the lungs, especially the apices, become dilated, and temporarily, or in severe cases, permanently, emphysematous.

### CAUSES

Cough can be caused by irritation of any of the mucous membranes of the air tract, by irritations of the nerves in the lung tissue, by irritations of the pharynx, by reflex irritation of the vomiting center, and by any irritation that can reach, through the pneumogastric nerve, the center in the medulla. From any of these reflex causes efferent impulses are transmitted, and the result is a cough. Irritation in the nose and ear may cause cough.

Pain and muscle tire from prolonged coughing, besides occurring in the lower part of the chest, occur in the sides, low down, perhaps in the region of the insertion of the diaphragm, and also in the back even down in the lumbar region. These strong contractions of the abdominal muscles during coughing also aid in temporarily diminishing the capacity of the

thorax by pushing upward the abdominal organs. At the same time there is a considerable force exerted downward, which may tend to cause uterine displacement, hemorrhoids and even involuntary urination.

Before this forcible expiration or cough there is generally a deep, quick inspiration; then the glottis is partially closed and the air is propelled upward forcibly, causing friction which tends to expel anything on the walls of the mucous membrane of the bronchial tubes and trachea. Even in simple bronchitis, if there is much coughing, there will be found increased resonance in the apices of the lungs, as there is probably always a temporary emphysema.

Nasal irritations may produce cough as frequently as they cause asthma. Irritations of the nasopharynx and pharynx proper frequently cause coughing, which is very likely to be accompanied by retching and even vomiting. An elongated uvula may tickle the epiglottis and cause spasmodic, quick expiratory coughing. This cause, however, is rare compared with the frequency of cough caused by an enlarged lingual tonsil, whether the tonsil is hypertrophied, contains dilated blood-vessels, or is inflamed. Any disturbance of this gland or lymphoid tissue may cause a tickling in this region sufficient to produce a very irritating and disturbing dry cough, which comes on sometimes in paroxysms, until a certain amount of mucus is literally scraped off. The very intensity of the cough so irritates the part, like scratching a spot on the skin that itches, as to stop the tickling sensation for a time. Irritations of the larynx almost always cause cough. Hence no examination of a patient who coughs is complete without a throat and larynx observation.

#### TYPES OF COUGH

The dry bark of spasmodic croup is very characteristic. The noise is low pitched, and is a bark. If it is husky there is mucus or membrane present.

The cough of bronchitis can be of all descriptions; it may be dry, may be non-productive, and may be moist and productive. Pain in such cough (the same is true of grip) is referred under the sternum, and is

due largely to the vibrations of the air on the inflamed mucous membrane of the trachea and perhaps larger bronchi.

The cough of pneumonia is at first somewhat painful, and the pain is referred to the side, near the nipple. This cough may be at first dry, but is soon productive and generally should not be discouraged.

The cough of pleurisy is non-productive and undesired, and is never loud, as it is repressed. It causes pain referred to the side. There is nothing to expectorate, and it should be discouraged and stopped.

The cough in the first stages of tuberculosis is often dry and catchy; it is a hack. There is no great intensity to this cough, and no necessity for it, and it should be discouraged. As soon as there is much local bronchial catarrh the cough should, as it is then productive, not be discouraged, except at meals, and in the presence of others; that is, such patients should be taught when to cough. In laryngeal tuberculosis the ulceration of the cords produces usually a peculiar croaking cough.

The cough of asthma is a wheezing affair and accompanied by all sorts of rattlings; the same type occurs in a stuffy, asthmatic bronchitis. This cough is generally not harsh.

Nervous cough usually consists of a single effort often repeated from time to time with monotonous regularity.

The coughs of different individuals vary. Some always cough with great intensity, and others easily and lightly. Older persons seem to raise mucus and pus from the bronchial tubes with difficulty, and it takes a great many coughs to raise the sputum for expectoration. Young children cough easily, but generally swallow their sputum. Very weak patients will hardly expectorate at all. In such cases the foot of the bed may be raised at night; also when they cough while in bed, they should turn onto the side or stomach in order to raise the sputum, or they should lean over in order to have gravity aid as much as possible the expulsion of the mucus, etc. The cough of pertussis occurs in showers or paroxysms, and at the height of the disease the glottis closes during inspir-



ation, and the air is sucked in through a more or less narrow slit, giving the characteristic "whoop."

Persons coughing very hard, as typically in whooping cough, but also in emphysema and in the severe bronchitis of strong, sturdy men, will cause a great deal of cardiac disturbance by retarding the flow in the large vessels of the thorax, thus increasing the work of the heart, especially of the right side. Such coughing can force backward the blood in the large veins thus congesting all the organs, notably the eyes, face and head, and whooping-cough can cause a cerebral hemorrhage or a hemorrhage into the eyes. These patients may not infrequently have nosebleed, and even vomit blood.

### ACUTE BRONCHITIS

There is no question that, whether bronchitis occurs in an adult or in a child, the patient will recover more quickly if he remains in bed for one or more days.

The prophylactic treatment is the same as for an acute coryza, and these treatments will more or less relieve the congestion in the bronchial tubes and promote expectoration, if the disease is not aborted. The cough is at first non-productive, but as soon as mucus begins to be plentifully secreted the cough is productive, the tightness of the chest is relieved, and the patient feels better. One of the best promoters of a free mucus secretion is ipecac, and a few drops of the syrup of ipecac, given every hour, unless nausea is caused; or from 0.03 to 0.05 gm. (about  $\frac{1}{2}$  to 1 grain) of the powdered ipecac may be given every two hours. The ipecac should never be pushed to the point of causing uncomfortable nausea. The dose should, therefore, as suggested, be very small.

In the second stage of bronchitis there is no expectorant that seems to work so well as ammonium chlorid, and the dose should be about 0.25 gm. (4 grains) every two hours. The bad taste of this drug may be well covered up by giving it in a sour mixture, as the syrup or citric acid and water. If the cough is excessive and more than the secretion calls for, there is possibly no better method for its control than to give small doses of codein sulphate. This may be combined with the ammonium chlorid in a sour mixture, as:

	Gm. or C.c.	
R Codeinae sulphatis.....	0 20	gr. iv
Ammonii chloridi.....	5	3 iss
Syrupi acidi citrici.....	25	fl℥ i
Aquae .....q. s. ad	100	fl℥ iv

M. Sig.: A teaspoonful, in water, every two or three hours.

This prescription is for an adult, but it may be readily modified according to the age of the child. If the codein is not desired, it may be omitted. If it is desired to give the ammonium chlorid less frequently, the dose may be made larger. If a sweeter mixture is preferred, the syrup of tolu may be substituted for the syrup of citric acid; or both the syrup of citric acid and the water may be omitted and the syrup of wild cherry substituted.

If the larynx is inflamed, the inhalation of simple steam, or of medicated vapors, may be of value, but a patient with laryngitis of any type should be under very careful observation by a physician. The steam for inhalation may be modified by adding to the boiling water oil of eucalyptus, 5 minims to the pint, or compound tincture of benzoin, 1 dram to the pint.

If the expectoration becomes more profuse and seems not to stop readily, terpin hydrate is of value. The dose is 0.30 gm. (5 grains) about four times a day. This may be given in tablet or in powder; solutions are unsatisfactory as it is very insoluble. If deemed advisable it may be combined with codein in small doses.

If the coughing persists longer than a week, the sputum should be examined to determine what germs are present. If it proves to be a simple bronchitis, but prolonged, sodium iodid in small doses may be of value, especially if the patient is at all asthmatic, or should he be an elderly person. Fresh air, good food and iron are always of value in curing all kinds of bronchitis. If the patient is a child and the nutrition is poor, plenty of good food rich in fats should be supplied. A bronchitis that will not stop must be treated as a pre-tuberculous stage of tuberculosis, and the patient should receive climatic, or open air rest cure treatment.

It should be emphasized that a patient with bronchitis is not properly supervised unless the temperature is taken, and this more or less frequently. A patient with a fever should remain at home, if he wishes to avoid complications that readily occur from an acute bronchitis or grip. The district nurse or the medical inspector should always take the temperature of a coughing child. If a child has any fever, it should be sent home and the family physician summoned.

### ASTHMA

In the first place, the disease asthma should be dissociated from conditions which are termed asthmatic. A patient may be asthmatic from various causes, but the term asthma should be limited to the disease or condition itself, i. e., periodic attacks of bronchial spasm. More or less continued dyspnea, with or without whistling râles, and with or without acute attacks of asthma, may be caused by cardiac disease, cardiac asthma; by renal insufficiency, renal asthma; by plethora, causing attacks of acute hyperemia of the lungs; by arteriosclerosis; emphysema; diabetes; thyroid disturbances, and by the various anemias. Spasmodic asthma may be caused by bad heart attacks; by acute toxemia from renal insufficiency; by exacerbations of gout, probably due to a toxemia from nitrogenous metabolism; by acute indigestion, and by gastrointestinal irritants causing a swelling of the mucous membranes of the bronchial tubes, really an urticaria. This swelling of the mucous membrane of the bronchial tubes has been caused by injections of horse serum.

### CAUSES

The diseased condition, or neurosis, termed true asthma, is often due to irritation of the nose and throat, and sometimes of the ear; is frequently due to chronic bronchitis, often is concomitant with acute disturbances of the mucous membranes of the upper air passages, as when caused by irritations from pollen, such as hay fever, rose fever, and by various dust and drug irritants. Asthma, however, is frequently a simple respiratory neurosis.

## SYMPTOMATOLOGY

An attack of asthma generally occurs at night, and may be preceded by headache, some symptom of indigestion, mental depression or nervous irritability. There is at first some slight dyspnea and a short dry cough. The dyspnea and consequent cardiac distress increase, and the agony suffered by these patients can not be understood unless one has seen them suffering from an attack of this terrible disease. The agony is almost as great as that of acute cardiac dyspnea, although there is not much mental anxiety. The patient may be pale or almost livid, and the expression of the face shows the suffering due to attempts to inspire, and then to expire, through the contracted bronchial tubes. The muscles of inspiration being stronger than the muscles of expiration, for a time more air enters the lungs than can get out, and little by little there is increased chest distention. Percussion shows hyper-resonance. The greatest amount of wheezing, as shown by the stethoscope, is in expiration, and the expiration is prolonged in the attempt to empty the lungs and prepare them for the next inspiration. If the bronchial secretion begins, as it generally does, moist râles may also be heard, and, after a series of spasmodic efforts, the cough brings up white glairy mucus.

The length of these attacks of acute asthma, if unrelieved, varies from an hour or two to all night, and sometimes an attack may last several days. Occasionally the attacks last for many hours, or even days, in spite of all treatment, and any temporary relief given by powerful drugs may not prevent the resumption of the asthmatic spasm the moment the patient is out of the influence of the drug. The amount of dyspnea that the patient has, and the amount of suffering and the seriousness of the attack, do not bear a close relation to the amount of wheezing that is heard. A patient may not suffer greatly from dyspnea so long as he is sitting upright, and yet be wheezing like a decrepit old horse.

The longer the paroxysm lasts and the more intense it is the greater the danger of permanent injury to the heart and the greater the danger of the distention



of the chest so injuring the lung tissue as to make the emphysema permanent. Even after repeated attacks most patients have no cardiac injury and no lung injury, but this is doubtless because most of those who suffer from acute asthma are young; the older patients do have more or less lasting bronchitis, heart debility and more or less constant dyspnea and often emphysema. It is rare for a patient to die during an attack of acute asthma, but the condition should always be considered serious, as it could never be decided how much future disability was caused by the prolongation or repetition of such serious disturbance of the vital functions of respiration and circulation.

Acute attacks of asthma may occur every night for a series of nights, and then not for a long period, or after one attack there may be no more for some time, or they may occur more or less periodically, or they may recur only at certain periods of the year or in certain places. These last are likely to be due to nasal irritations. The attacks may also occur more or less frequently for several years, or even for a lifetime.

#### GENERAL TREATMENT

The opinion is gaining ground that asthma is a form of anaphylaxis. The physician should endeavor to ascertain what type of hypersensitiveness each case presents.

Gottlieb (*Jour. A. M. A.*, 74, 931, April 3, 1920) has outlined the form for a systematic examination in these cases which is quite suggestive. There should come first examination of the nose, throat and teeth and roentgen-ray examination of the head to determine the presence or absence of pituitary enlargement, and disease in the alveolar processes of the jaws. Search should then be made in other parts of the body for infected areas or absorption of toxic material, such as may occur from a diseased appendix, gallbladder, prostate, ovary, etc. Bacteriologic examination of the nasal discharges, pus from the tonsils and tooth sockets, bronchial secretions and stool should follow. Suspensions of the individual bacteria isolated from the various secretions and discharges should be prepared for

the purpose of making skin tests. These skin tests are also to be made with stock bacterial proteins, epidermal and food proteins, and pollens.

The treatment of this troublesome disease, or condition, will never be a success unless the cause has been determined, and, if possible, removed. Hardly any patient with any disease should receive a more careful general examination than the asthma patient. The lungs must be carefully examined for bronchitis and emphysema, and more serious conditions found or eliminated, and the blood pressure taken. The digestive ability of the stomach and intestines should be investigated, the urine should be examined, and all possible reflex causes sought in the throat, nose or ears. If all tangible causes of the asthmatic attacks have been eliminated, a careful analysis of the excretion of the various salts and solids in the twenty-four hours' urine, on a known diet, should be made. Even careful examinations of the feces, on a known diet may give conclusive evidence of the cause of the toxemias that give rise to asthma. Finally the response to cutaneous sensitization tests with various food substances prepared as vaccine for this purpose may be thoroughly studied with a view to finding some substance to which the patient has an idiosyncrasy.

#### SENSITIZATION

According to I. Chandler Walker (*Jour. A. M. A.*, Aug. 4, 1917) bronchial asthmatics who are sensitive to specific substances have the onset of their asthma early in life, are not usually subject to chronic bronchitis nor to cardiorenal disease. Those not sensitive have asthma after 40 years of age and have the two complications mentioned. The sensitive patient will usually be found to respond with a positive skin test to one of the following kinds of protein: horse dandruff, staphylococci, wheat, pollens, cat hair and a few very common foods. The skin test is made as follows: "A number of small cuts, each about one-eighth of an inch long, are made on the flexor surfaces of the fore arm. These cuts are made with a sharp scalpel, but are not deep enough to draw blood, although they do

penetrate the skin. On each cut is placed a protein and to it is added a drop of tenth normal sodium hydroxide solution to dissolve the protein and to permit of the rapid absorption. At the end of a half hour the proteins are washed off and the reactions are noted, always comparing the inoculated cuts with normal controls on which no protein is placed. A positive reaction consists of a raised white elevation or urticarial wheal surrounding the cut. The smallest reaction that can be called positive must measure 0.5 cm. in diameter.

#### DRUGS IN ASTHMA

Perhaps the most frequently successful drug in preventing the recurrence of asthma is an iodid, and this is probably because most asthma is due to affections of the air passages, and this drug is specifically a stimulant to the mucous membrane of the nose, throat and bronchial tubes. If any chronic disturbance is located in these mucous membranes the iodid tends, first, to increase the exudate from these membranes, then to make the mucus more liquid, and, while at first apparently irritant, soon relieves congestion of these membranes, and often, sooner or later, cures a chronic congestion and causes the membrane to become healthy. Hence the frequency of success from iodid simply emphasizes the necessity of a careful examination for, and the removal, if found, of any nasal obstructions or irritations. After such removal, a sensible treatment to prevent the recurrence of attacks would be the prolonged administration of iodids, and very large doses are seldom needed, or if the history of the attack shows long standing of the disease, the treatment of the neurosis by bromids is advisable, and here again the dose should not be large. We should not produce debility either with iodids or with bromids.

Arsenic seems at times to have a specific action. In chronic bronchitis, in asthma, and in catarrhal conditions of the upper air passages, arsenic, when given for a long period, is sometimes of considerable benefit. The respiratory ability and freedom from colds and coughs of the arsenic eaters of France and the Alps is well known.

A local cause in the upper air passages having been removed, if there was any such, besides treatment either by iodids or bromids, if either one is deemed advisable, anything that will improve the general health of the individual should be utilized. An occupation in which there is an atmosphere of dust or other irritant should be changed for one more suitable. Perhaps indoor work should be changed for outdoor work, perhaps the climate or location should be changed. Any indigestion, gastric or intestinal, should be corrected; constipation should be prevented; anemia should be treated, and insufficiency of the thyroid, if present, should be noted and modified.

If asthma occurs at certain periods of the year as does hay fever, the preventive treatment is the same as for hay fever. Anything that will reduce the nasal irritations and congestions will relieve the asthma, and any change in location that will prevent the hay fever will generally prevent the asthma. To just what locality or climate an asthmatic patient should be sent is difficult to determine. Also it is impossible to predict that, because one patient is benefited by a sojourn or residence in one particular place, that place will be beneficial to the next patient. Theoretically, regions free from dust and vegetation should be the regions to prevent attacks of asthma. Sea voyages are sometimes beneficial and sometimes not. The decision as to whether or not benefit will be derived from certain regions may often be determined by a careful investigation into the condition of the patient's mucous membranes and the condition of his circulation.

Anything that would tend to make the circulation better in the mucous membranes of the upper air passages and diminish congestion and tumefaction of the mucous membranes of all the air passages will tend to prevent recurrences of asthma. Cardiac insufficiency, of course, should be properly treated, and whether the heart needs digitalis or the arteries need nitroglycerin or nitrites continuously, or whether the general good effect of ergot on the circulation is needed (and asthma may sometimes be prevented by ergot) must be determined by a careful study of the individual patient.



Insufficiency of the kidneys as a cause of asthma should be treated by the proper diet and the prevention, if possible, of nitrogenous toxemias. Such asthma is an indication of nitrogenous poisoning. The asthma due to gout is often best combated with thyroid, and when there is insufficiency of the thyroid in young individuals, which may be recognized by well-known signs, such as amenorrhea or scanty menstruation in women, an unusual and undesirable increase of fat, a dry condition of the skin, and a tendency to nitrogenous poisonings, the asthma will be benefited by small doses of thyroid, perhaps, coincidentally administered with small doses of iodid, as iodid has been shown to be the most active stimulant of the thyroid gland.

#### TREATING THE PAROXYSM

The best treatment of the paroxysm of asthma must be decided by a careful study of each individual patient. There is no one best treatment for the asthmatic attack. The drug that most frequently is successful in rendering the patient comfortable and shortening the paroxysm is, of course, morphin, but before the physician begins the treatment of the asthmatic attacks with morphin he should have exhausted his other resources, as he is not sure that he can cure the asthma, even if he removes the reflex cause, and such patients readily acquire the morphin habit. If a given patient is incurable under the surroundings and conditions in which he must live and no other drug will relieve his suffering, he doubtless has the right to receive morphin, even if he does form the habit.

In endeavoring to abort or shorten the attacks we may have recourse to narcotics, which relieve the paroxysm by inhibiting the reflexes and dulling the receptive centers. Such drugs are morphin, bromids, chloral, and chloroform by inhalation.

Macht and others have reported that benzyl benzoate given by mouth was capable of producing relaxation of the bronchial spasm in patients suffering from true asthma. Not all cases of asthma respond equally well but in some cases the beneficial effects were pronounced.

We may use drugs that dull the peripheral nerves and prevent their susceptibility to the irritation from which they are suffering and thus abort the paroxysm. Such drugs are mostly of the atropin group, as belladonna, stramonium and hyoscyamus. The effective action is atropin action, and doubtless atropin, and perhaps scopolamin (hyoscin) will do all the good that the crude drugs can do, although inhalation of the fumes from burning stramonium leaves has been used with success for centuries.

We may consider the treatment with such drugs as cause muscular relaxation by prostration. Such are emetics, and tobacco with patients who are not used to its action.

The next group of drugs whose action we consider in the treatment of asthmatic attacks are vasodilators. These drugs not only dilate the peripheral blood vessels and therefore relieve congestion in the mucous membranes of the respiratory tract, but also are preventers of muscular spasm. Such are, of course, the nitrites in the form of amyl nitrite, sodium nitrite, and nitroglycerin. The iodids will also cause lowered blood pressure, but are hardly of value during the attack.

Many times quite the reverse of this dilating, relaxing treatment is indicated in an asthma paroxysm. The vasoconstrictors are indicated, and if used in these instances will abort the attack. The best are solutions of epinephrin sprayed on the mucous membranes of the nostrils or throat, or into the larynx, or an epinephrin preparation in tablet form may be dissolved and absorbed in the mouth. The action is of course immediate, and sometimes so is the relief. For the nostrils epinephrin spray solutions of from 1 to 10,000 to 1 to 5,000 (diluting with a mild alkaline solution) may be used. In the throat and larynx a strength of 1 to 3,000 may be used. Digitalis is sometimes of advantage in these attacks even if there is no cardiac lesion or cardiac debility. Intramuscular injection of an aseptic preparation of ergot is also sometimes efficient treatment in stopping the paroxysm.

Citrated caffein, or strong coffee, or strong decoctions of tea are of benefit during the asthmatic attack in some individuals. The favorable action of caffein

must be due to the cardiac stimulation and possibly to stimulation of the respiratory center.

Strychnin given hypodermatically has been much recommended for the asthmatic attack. While it generally fails, it sometimes does a great deal of good to patients who have bad heart action. A combination of strychnin, morphin, and atropin given hypodermatically sometimes seems to act better than when the strychnin is omitted.

### INHALATIONS

Almost from ancient times paroxysms of asthma have been treated by the inhalation of fumes from burning medicinal substances. For this purpose the medicated substance may be in the form of cigarettes, powder, cones, or papers. Sometimes the fumes of these burning powders are directly inhaled, or the patient's bedroom is allowed to become filled with the fumes. Sometimes the attack is relieved by the inhalation of steam, or the vapor of boiling water in the room of the patient adds some relief. Sometimes liquid medicaments are added to boiling water in various apparatus for inhalation. Most popular, however, and most frequently used are the powders or papers, or pastils that are burned and inhaled directly.

Probably nearly all the powders or papers ordered by physicians for inhalation for asthma and almost all of the patented preparations and nostrums contain niter (saltpeter) and stramonium, or belladonna, or other atropin-containing drug. The action of the niter, i. e., potassium nitrate, fumes is to cause relaxation both of the blood vessels and of the bronchi. Papers are saturated with solutions of potassium nitrate, and when dry may be rolled in the form of a cigarette and smoked, or may be burned in any other form, and the fumes are beneficial to some patients. The addition of potassium nitrate to other medicinal powders causes them to burn more readily and give off their fumes.

Stramonium (leaves) is the most frequent form in which the alkaloid atropin is administered by inhalation. The action of the atropin thus locally applied is to dull the irritability of the peripheral nerves in the nose, throat and larger bronchial tubes, and thus by

relieving irritation it tends to relieve spasm. At the same time the atropin acts as a circulatory stimulant.

Various combinations of drugs are used for inhalation for asthmatics, many of which are nostrums (but have been analyzed) and have more or less efficiency in relieving the attack, because of the potent drugs often recklessly employed. The asthma nostrum vendor is looking mainly for immediate results, and he cares little what the danger to the patient may be or how strong a dose he gives; consequently, he orders sufficient amounts of the drugs to cut short the asthmatic attack. Therefore, the prescription which a physician is willing to write may not be so successful in a certain case as the nostrum temporarily may be.

#### PROTEIN IMMUNIZATION

Walker found that asthmatics who were sensitive to proteins in horse dandruff or cat hair were relieved of attacks during a series of subcutaneous injections with these proteins. Treatment was begun with a dilution of the protein next higher than that to which the patient reacts, sometimes as high as 1:100,000. The strength of the dilution is then slowly and gradually increased waiting for a subsidence of response following each injection. The largest number of doses required was forty-two, the average number was eleven. The protein extracts are injected intramuscularly with all of the precautions that accompany any surgical procedure, including thorough cleansing of the skin, sterilization of the syringe by boiling, and absolute surety that the injection is not being made directly into a blood vessel.

Oxygen inhalations have sometimes been used by asthmatics, and with relief. This, however, is not very dissimilar to breathing the outside air, and will, of course, partly relieve the oxygen starvation. A patient who must go to the window and gasp for breath should, perhaps, have an oxygen tank in his room to use when he needs it.

If we were to sum up the best treatment for the paroxysm of asthma we must say morphin and atropin hypodermatically, the administration of nitroglycerin



by the mouth, or epinephrin into the nostrils or throat, or tablets containing epinephrin dissolved in the mouth, and fumigations with potassium nitrate and stramonium.

### HAY-FEVER

This troublesome condition is most frequent in the late summer and early fall months, but it may occur at other times of the year in different climates, depending on the susceptibility of an individual to various pollen-bearing plants. While bacteria may increase the intensity of the disease, or may cause a patient to become susceptible to it, still hay-fever is probably always caused by irritating pollen.

The disease is present only in regions where pollen-rich plants predominate, and occurs only when these plants have reached the stage of disseminating the pollen, or when the pollen is artificially introduced into the nostrils of a susceptible person. When a patient is removed from all source of pollen, or when the offending weeds are destroyed in the region in which the patient lives, hay-fever does not occur.

Hay-fever is no respecter of persons, and may occur at any age, in both sexes and in any civilized race. It is more frequent, however, in males, and more frequent in the white race than in the colored race. The age of greatest susceptibility, or the age at which most cases develop, seems to be in the decades from 10 to 40. This age of greatest incidence and the reason that males are more affected than females may signify the age and sex most exposed to pollen.

Scheppegrell, president of the American Hay-Fever Prevention Association, finds that hay-fever may be artificially produced at any time in hay-fever subjects. If the inoculation of the irritating pollen, which he finds to be the male elements of the flowering plants, is given to the patient at another period of the year than the hay-fever season, the length and degree of the attack may be accurately controlled. This is because, unlike micro-organisms, the male elements of these pollens cannot reproduce themselves.

The reaction from these pollens he divides into the direct and indirect effect. Some produce the reaction by the local mechanical irritation, and this perhaps

even in persons not susceptible to hay-fever. In insusceptible subjects, the reaction ceases as soon as the pollens are discharged. The indirect effect occurs in susceptible persons who are poisoned by absorption of some toxalbumin contained in the pollen.

While the pollen of many plants may cause hay-fever reaction when applied directly to the nostrils, it is only the wind-borne pollens that need to be considered in hay-fever. Scheppegrell states that it is characteristic of hay-fever weeds that they have no attractive flowers or perfumes, and these hay-fever plants are "the ragweeds, wormwoods, cockleburrs, careless weeds and grasses." In the United States, the spring type of hay-fever is caused by the grasses, while the fall types are caused more by the ragweeds, the cockleburrs and the wormwoods. While it seems to be a fact that goldenrod is a cause of hay-fever, Scheppegrell doubts that it is a frequent cause.

#### SUSCEPTIBILITY AND PREDISPOSITION

There can be no question that a susceptibility to hay-fever must exist since so few persons (1 per cent., according to Scheppegrell) in a locality overrun with these weeds are subject to the affliction.

Cook, Flood and Coca (*Jour. Immunol.*, 1917, 2, 217) after careful investigation of the subject of sensitization, sum up thus:

1. Hay-fever is the clinical symptomatic expression of local hypersensitiveness. The active pollen substances are not toxins.

2. The hypersensitiveness is established spontaneously and never by immunologic process. This has been shown in two ways: first, by the observation that individuals may be sensitive to pollens of plants that are indigenous in foreign countries and with which they have never come in contact; and second, by the observation that individuals who are naturally sensitive to one protein only cannot be artificially sensitized to another protein, either animal or vegetable.

3. The sensitization is not directly inherited, although the tendency to spontaneous sensitization is inherited as a dominant character.

4. The antibody-like substances of human sensitization are not demonstrable in the blood of sensitive persons by any of the immunity reactions. They are present in the cells of the

sensitive tissues. They cannot be increased artificially by the usual process of immunization.

5. The mechanism of the alleviating effect of specific, that is, pollen extract therapy, is the same as that of desensitization in experimental anaphylaxis. The freedom from symptoms lasts as long as the respective "antigenic" substances remain in combination with the antibody-like substances in the tissues.

Persons who are attacked by hay-fever may be predisposed by some other cause than a peculiar hypersensitiveness of the mucous membrane of the nose. These patients, many times, are found to have anatomic malformations, such as hypertrophic turbinates or deviated septums, or other obstructive or irritative conditions in the nostrils, and many of these patients are cured by the removal of these abnormal conditions. In other instances more or less incurable pathologic changes may be present in the mucous membrane of the nose and adjacent sinuses. Furthermore, a neurotic individual may be more hypersensitive to this irritation than other persons without any assignable physiologic, pathologic or anatomic excuse.

On the other hand, as shown by Strouse and Frank (*Jour. A. M. A.*, March 4, 1916, p. 712), persistence of a hay-fever attack may well be due to an associated bacterial acute or subacute infection. An associated infection may allow more of the pollen irritant to become absorbed, and the disease is then intensified and is more difficult to cure. Continuing their studies they have confirmed their earlier impressions (*Jour. A. M. A.* 74: 1593, May 11, 1920) that it is important first to clear up all anatomic deformities of the nasal tract, then to correct local infections and then to administer combined pollen and vaccine treatment.

Hay-fever due to pollen should be differentiated from similar conditions caused by emanations from animals, such as the horse, cat or dog, and from odors from certain fruits, flowers, and from ipecac and musk. Sneezing, lacrimation, coughing and asthma may occur in some persons, who have such peculiar idiosyncrasies. Bronchial asthma may occur as a separate entity, or be associated with or follow hay-fever; hence its treatment often is the same as that of the hay-fever.

The symptoms of an attack of hay-fever may begin immediately on inhalation of the pollen, or they may be delayed for a few hours; but sneezing, congestion of the nostrils, reddening and itching of the eyelids or of the inner canthi of the eyes, irritation of the roof of the mouth and throat, and soon more or less spasmodic attacks of sneezing are the primary symptoms. Later rhinitis may occur, with more or less conjunctivitis, pharyngitis and bronchitis. There may be temporary increased temperature, but soon there is depression, more or less weakness, and often sub-normal temperature.

#### GENERAL TREATMENT

1. All predisposing causes should be ascertained, and if possible, removed.

(a) Hypertrophic and sensitive mucous membrane of the turbinates should be removed. An obstructive and deflected septum should be corrected. An infected sinus should be cleaned.

(b) All infected areas in the mouth and throat should be removed.

(c) Meat and purin bases should be removed from the diet. Although the diet should be nutritious, it should contain no irritating substances, such as mustard or other condiments. Tea and coffee are contraindicated. Fish, strawberries, and any other food that is likely to cause anaphylactic irritability should not be allowed.

(d) The bowels should be carefully regulated so that toxic intestinal substances are prevented from entering the circulation and adding to the disturbing elements already present in the blood.

(e) Alkalis should be administered to decrease any possible hyperacidity of the system. There is no better alkali than sodium bicarbonate, which should be administered for a few days at least in a dose of 1 gram (15 grains) every three hours. It is pleasantly given as an effervescing salt.

If preferred, potassium citrate may be the salt administered. The dose should be 2 gm., given in wintergreen water, and administered four times a day. There is no question that alkalis many times diminish



the irritability caused by anaphylaxis, and it has long been recognized that alkaline sprays in the nostrils are of benefit, and alkaline gargles are soothing, in hay-fever.

(f) Calcium is often of value in hay-fever, as it is in hives, in angioneurotic edema, and in some forms of asthma. Calcium may be administered as calcium lactate, or as the more irritant calcium chlorid. If the lactate is used, and especially if the chlorid is used, it should be administered after food has been taken, and then largely diluted.

(g) An associated bronchitis should be treated as though the hay-fever were not a factor.

(h) A weakened heart should be strengthened. The persistent sneezing and the frequent coughing in hay-fever always more or less weaken and temporarily, at least, dilate a heart, and a hay-fever patient generally is improved by digitalis. Of course, if the heart is sturdy, if there is arteriosclerosis and hypertension, digitalis may not be indicated, and nitroglycerin may be of value. Strychnin is generally inadvisable, on account of its increasing the general nervous irritability.

2. If possible, all pollen-bearing weeds in the immediate neighborhood of the patient's home should be destroyed; otherwise the patient must migrate to some pollen-free region.

3. The symptoms should be ameliorated. Most patients certify to the relief obtained from simple alkaline sprays in the nose and throat. Such treatment is well represented by alkaline tablets, consisting essentially of sodium bicarbonate and borax, dissolved in 60 c.c. (2 fluidounces) of warm water. Epinephrin sprays, in solution of 1:10,000, are used, and are frequently of value. It may also be used as an ointment of 1:1,000, and a small portion placed in each nostril. Some persons, while getting immediate relief from epinephrin solutions, later have increased congestion and extra sneezing, but the majority of patients are benefited. Sometimes a weak menthol, or menthol and camphor, oil spray or ointment benefits the patient. While cocain may be used by the phy-

sician in his office, if he thinks it advisable in an individual case, such solutions should not be given to the patient, and should not be used frequently by the physician. Boric acid washes and eyedrops will generally relieve the itching of the eyes and eyelids and will be soothing in conjunctivitis. If the nasal discharge is very profuse and watery, atropin sulphate in a dosage of 1/500 grain every two hours may be given until there is a dryness of the throat.

If there is much asthma and the patient wheezes and has hard work to get his breath, and the bronchial secretion is not sufficient, sodium iodid in a small dose to cause an increased secretion may be good treatment, although it will almost invariably increase the nasal secretion.

4. The only drugs that have proved of much value in hay-fever are quinin and antipyrin, and these are not very efficient. Large doses of quinin have been found successful in some cases. Antipyrin in large doses has also modified the attacks, much as it may modify the paroxysms of a whooping cough; but the doses must be large, and during its administration the heart should be protected by digitalis. Arsenic and strychnin have been advocated, but have not been proved of much value.

#### SPECIFIC TREATMENT

*Preventive.*—Before it is decided to use a pollen extract, it is advisable to ascertain the particular pollen to which the patient is susceptible. The skin test is safe and generally satisfactory; the eye test is hardly justifiable. Various dilutions of different pollen extracts should be tried in this test. The arm is generally employed for this purpose. Several scratches through the epidermis are made, and a drop of the pollen extract, beginning with a well diluted solution, of first one hay-fever weed and then another, is used to note the sensitivity. A patient sensitive to an extract soon shows local irritations at the point of absorption. As soon as the pollen that causes reaction is found (the reaction occurring in from five to fifteen minutes), various dilutions of this particular pollen

may be tested to determine the dose correct for this particular patient, and the first dose of injection should be the dose which fails to excite a skin reaction. The first subcutaneous injection should not be given until after all symptoms of the local skin test reaction have subsided.

As it is not always feasible to test out the individual pollens as described above, the stock preparations of mixed spring or fall pollens may be used. Full directions for the use of these pollen extracts for diagnostic purposes, for immunization, and for curative purposes, come with the package.

The preventive treatment of hay-fever should be begun about eight weeks prior to the season in which the patient is susceptible. Ordinarily from ten to fifteen injections are required, and they should be given at two or three day intervals, depending on the amount of reaction. If symptoms of anaphylaxis or hay-fever symptoms occur, the dose should be smaller and less frequent. If the patient, from such injections, is immune for that year, he may be immune to the hay-fever pollen the following year; but it seems to have been shown that this immunity is only weak and rather ineffective by the third year. However, sufficient statistics have not yet been offered to show how long an immunity may last; also failure to produce immunity must be expected. Strouse and Frank find the immunity gradually increasing from year to year. The theory of this treatment is that a person sensitive or sensitized to a certain pollen may be desensitized by exhausting from the body cells the specific proteolytic enzymes by the pollen protein injection.

*Curative.*—Not enough data have been presented to show the value of the vaccine and pollen treatment during the active process of hay-fever.

It would be inadvisable, however successful in individual cases the pollen treatment might prove to be, to omit the therapeutic suggestions already mentioned. It would also be inadvisable to depend on possible immunization for the following year by means of pollen extracts and to omit a careful study of the patient to eliminate, if possible, all predisposing causes of hay-fever disturbances.

# DISEASES OF THE GASTRO INTESTINAL TRACT

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## HYGIENE OF THE MOUTH AND TEETH

The things to be remembered in the care of the mouth and teeth may be summed up as follows:

1. Theoretically water should follow the milk of bottle-fed babies.

2. A soft cloth should be thoroughly moistened with a mild alkaline wash and frequently applied over the first little teeth of the infant.

3. No candy, or at least but little, should be given to young children, and as soon as their teeth have erupted they should have the more crunchy or granular cereals, and not so much of the soft, gelatinous cereals.

4. The teeth should be regularly cleaned by a dentist, at least once in six months.

5. All cavities, even small, should be filled, at least with temporary filling, so that the first teeth may be preserved as long as possible in order to develop the jaws properly, so that the second teeth need not be crowded.

6. The teeth of children and adults should be thoroughly brushed at least twice a day, better three times, with a proper brush, and, at least in the morning, with a tooth powder that is not too soapy, and at night with an alkaline mouth wash. Tooth brushes must be clean.

7. All persons, growing children or adults, should have all the tartar that may become deposited cleaned from their teeth once in three months, and examinations of the teeth once in every six months will disclose small cavities before they have become large ones.

8. If the teeth tend to degenerate and cavities quickly form, the trouble is generally with the nutrition, and the person is often deficient in bone-forming salts. Such patients should receive lime salts, phosphates and iron.

The best iron preparations for this purpose are: tinctura ferri chlorid, 1 or 2 drops in a wineglass of



water or fresh lemonade, three times a day, after meals; ferrum reductum 0.05 gram (1 grain), in capsule, three times a day, after meals; ferri oxidum saccharatum tablets, each 3 grains, 1 three times a day, after meals.

If the teeth are delayed in eruption and do not grow properly in young children, the dried extract of the thymus gland may be of value. One of the tablets is given three times a day; it is best taken between meals, crushed with the teeth and swallowed with water.

If the child as a whole does not grow well, even if not a cretin or if he is in any way like a cretin, small doses of thyroid extract (thyroideum siccum) in dose of 0.03 gram ( $\frac{1}{2}$  grain) once a day, are of value, and this dose is sufficient.

9. The care of the mouth during severe illness should be on the lines previously described.

10. The proper care of the teeth will prevent pyorrhea, and infection, which is a menace to health.

11. The treatment of pyorrhea alveolaris must be strenuous and persistent. There is no excuse for its presence, and it can be eradicated. The treatment is persistent cleanliness and antisepsis, the same as in ozena. There is no excuse today for the horrible stench perpetrated by patients who suffer from ozena. The same is true of the nastiness of the breath of these pyorrhea patients, to say nothing of the danger to themselves of infection from germs harbored in the mouth. The elementary features of the treatment include a frequent use of a mouth wash of 1 part of peroxide of hydrogen solution in 4 or 5 parts of warm water, and then the persistent use of an antiseptic alkaline mouth wash and tooth paste or tooth powder after the peroxide of hydrogen has eradicated and removed the pus.

### MOUTH INFECTIONS

Only of late years has the part played by the mouth and its adjacent structures in the production of a great many pathologic processes has been demonstrated. The mouth, including the teeth, gums and tonsils, affords a broad surface and readily accessible means of entry

for various pathogenic micro-organisms. It is not always essential that visible evidence should be present in the mouth of the focus producing a systemic infection, to prove that the portal of entry is in the mouth. The focus may be discovered only by careful examination with the roentgen ray. A portal of entry may be present and not directly demonstrable in any way, for example, when the bacteria enter the lymph or blood stream by way of the tonsils. That a focus does exist in the mouth and that it is directly responsible for the pathologic condition has been repeatedly proved by removing the source of infection or by treatment with a proper autogenous vaccine made from bacteria isolated from the pus at the site of the focus. Such treatment often causes the disappearance of the systemic pathologic condition.

Within the mouth there are various channels through which bacteria may enter the system: the tonsils, gums, roots of the teeth, and by way of the esophagus to the stomach and intestine. That the tonsils play an important part in various infections has been demonstrated.

In this connection, the work of Rosenow has proved that many ulcers of the stomach are associated with tonsillar infections. He obtained streptococci from some of these ulcers, and after injecting cultures of these organisms into animals, he was able to observe gastric ulcers in them. Stone pointed out the relation between enlarged cervical glands and foci of infection of the tonsils, even though the tonsils may not be hypertrophied or inflamed. The short and direct communication between the tonsils and the lymphatics is responsible for this. In this way there may also result tuberculous adenitis. Infected teeth and tonsils are frequently the cause of endocarditis.

Perhaps equally common as a source of infection are the teeth. The open, exposed, ulcerated or decayed tooth is not always the worst in this respect. More harm may be done by the heavily crowned, capped and bridged teeth, under the poorly fitted margins of which the bacteria flourish and manage either to enter the lymphatics or to send their toxins into the system. There may also be a tiny abscess situated deep down at the root of the tooth. In these

cases local manifestations of a focus in the teeth may be entirely lacking, and may be demonstrable only by the roentgen ray. These so-called "blind-abscesses" may remain dormant a long time. Ultimately they open into the mouth by way of a sinus. Often they lead into larger abscesses in the bone, in which toxins are produced, giving rise to septic conditions. Depending on the nature of the organism in the abscess, there may result any of the complications so often resulting from tonsillar affections. Rosenow states that these foci are common in patients who for years have suffered from arthritis, neuritis, appendicitis, ulcer of the stomach, goiter, etc., and that persons with perfect health are, as a rule, free from sources of infection in relation to the teeth.

The treatment of the complications secondary to the focus within the mouth consists first of all in removing the mouth infection. Careful examination should be made of the tonsils and teeth, and if the tonsils are found to be hypertrophied or inflamed, even without visible signs of any abscess, they may be removed. Often the abscess may be located deep in one of the crypts. If any visible pus is present, it would be advisable to obtain a culture of the bacteria contained in it. Normal tonsils should not be removed. When the tonsils appear normal, even though there may be no history of tooth involvement, the teeth, nevertheless, should be carefully examined. Poorly fitting crowns should be taken off, and often underneath them may be found the cause of the trouble. Many cases of arthritis have been cured by a correction of the dental work of the mouth, removal or filling of ulcerated areas, and insertion of proper bridge work. Roentgenograms may locate a blind or apical abscess when least suspected. When such has been found, the tooth should be extracted. Rarely it is possible to drill into the abscess and in this way offer drainage for the pus. In this way also the tooth may be saved. Impacted, unerupted teeth are also a frequent source of infection.

Besides the removal of infection foci, a mouth wash may be indicated. There are many mouth washes on the market under various trade names. Many of these

contain the same ingredients and vary but slightly in their composition from those described in either the Pharmacopeia or the National Formulary. The best mouth washes are those that are alkaline, antiseptic and astringent. Some of the simpler antiseptic and astringent mouth washes are strong solutions of glycerin or of alcohol. Hydrogen peroxid, one part, to three parts of water is a good wash. For ordinary cleansing purposes sodium bicarbonate, in water, will serve the purpose. A list of good mouth washes appears in a later article.

Cleanliness of the teeth plays an important part in the asepsis of the mouth. By regular and frequent brushing of the teeth with a good, fairly stiff toothbrush and a simple tooth powder or tooth paste, the accumulation of tartar on and between the teeth may be to some extent prevented. In conjunction with this brushing of the teeth, gargling with a mouth wash will aid in cleansing the mouth. Equally if not more important in the care of the teeth is the periodic visit two or three times a year to a dentist, that tartar may be removed, that caries of the teeth may be early treated, and that the condition of the gums may be noted and pus pockets early discovered.

#### PREVENTION

Prevention of suppuration or other infection in the mouth is of the greatest importance all through life. The following suggestions for preventive measures may be of value:

1. There should be inspection of children's teeth in schools.
2. Every infected area in the mouth must be treated and eradicated, if possible, as soon as discovered.
3. The public should be taught that a bad tooth or a diseased gum or tonsil is serious, and neglect of such a condition may cause an incurable disease.
4. The mouth of every patient should be examined as part of the physical examination.
5. Roentgenograms of suspected gums or jaws should be taken, and if advisable, a culture from the pus or secretions of the infected region should be made.



6. There should be cooperation of the physician with the dentist to decide on what is best for the correction of mouth defects, whether certain teeth should be filled or pulled, or otherwise treated, and just what is the best treatment for a diseased gum or tonsil. Neither physician nor dentist is infallible, and both should recognize that cooperation is best for the patient.

## PYORRHEA ALVEOLARIS

### GENERAL CONSIDERATIONS

The occurrence of pyorrhea alveolaris varies among different classes of people. At present the care of the teeth has an important place in the daily routine of the better educated people, and although cases do exist among them, they are less frequent than among those who are strangers to the toothbrush and to mouth cleanliness. Bass and Johns state that they found pyorrhea in 95 per cent. of the cases examined by them. It is possible that their cases were collated from the poorer classes of people and from those suffering from tooth affections.

By pyorrhea alveolaris is meant a condition in which pus to a greater or less degree is present at the gingival margins affecting the peridental membrane and ultimately exposing the bone. As a result, pus pockets, from which pus escapes freely or may be easily expressed, occur. Predisposing factors are bad crowns, careless fillings, improper bridging, and, in all classes, neglect of the care of the teeth. Bacteria find a lodging place in the tartar deposited on the teeth or under a cap, and set up an inflammation. The gums become painful and tender, and there is a tendency to bleed easily from the slightest touch. Gradually the gums recede until pockets form between the teeth and gums in which the bacteria grow and thrive unchecked. Unless the disease is stopped, the teeth lose their firm support in the alveolar processes and become loose.

Pyorrhea alveolaris, just a local infection around the teeth, seems directly responsible for a large number of body ailments, produced by the entry into the lymph or blood stream of the bacteria

from the infected gums. Their toxins also produce systemic disturbances. It is also true that general systemic infections, by lowering the resistance of the gums, may be the starting point of pyorrhea alveolaris, which will continue after the general infection has been cured. Removal of the pus may cure the associated condition. It is also probable that the pyorrhea, through its micro-organisms and their toxins, reduces the physical resistance of the body to such an extent that it is readily susceptible to other invasions.

There has been considerable difference of opinion as to the cause of pyorrhea alveolaris. Fully 150 different organisms have been isolated from the gums and described. It has been assumed by many using vaccines that the real offender was a streptococcus, and that if such were obtained from the deep recesses of the pus-pocket, it could be used for the manufacture of an autogenous vaccine in the treatment of the condition. Hartzell and Henrici found streptococci in cases of pyorrhea alveolaris and dental abscess associated with arthritis deformans, acute articular rheumatism, endocarditis, pernicious anemia, gastric ulcer, and acute iritis. Vaccines were used with varying results, but these authors cannot positively state that vaccines have a definite value in these cases. They also found other organisms present with the streptococci.

Barrett and later Bass and Johns recognized the ameba or endameba as the specific micro-organism of pyorrhea alveolaris. There seems to be but little doubt that *Endameba buccalis* is a common invader of the tissues within the mouth, particularly the gums.

#### TREATMENT

Bass and Johns have recommended doses of 0.5 gm. emetin hydrochlorid hypodermically each day for from three to six days, the duration depending on the case, and also on the stage of the disease. They found that the endamebas disappeared from all lesions in 90 per cent. of their cases after a one to three day treatment.

The employment of iodine on the gums is both antiseptic and stimulating to the tissue of the gums which becomes firmer under its use. Talbot describes this

use of iodine as follows: A mixture which he calls iodoglycerol consisting of zinc iodide, 15, water, 10, iodine, 25, and glycerin, 50, is applied with cotton wound around wooden applicators to the gum margins above and below. The lips and cheeks are held away from the jaws until the iodine has dried. These applications should be made every day and continued until the patient is dismissed.

Most important in ridding the patient of pyorrhea are the services of a good dentist. Whatever the local or systemic treatment, the dental management of the retracted gums and eroded and diseased teeth is of primary importance and any treatment will fail unless the dental care is also successful. During such treatment Talbot suggests friction and stimulating methods be employed by the vigorous use of a "gum massage brush" to stimulate the gums. Such a brush, he says, should be so shaped that it will reach the festoons between the teeth. It should be made of the stiffest unbleached bristles that can be obtained. The brush should be inserted into the mouth, the mouth and teeth closed. When the tissues of the mouth have become revitalized, deposits from the alveolar process on the roots of the teeth will cease to form. As a gum wash for the patient to use in connection with gum massage he suggests a zinc carbolate mixture originally recommended by Whitslar:

Zinc sulphocarbolate.....	60 grains
Alcohol .....	1 ounce
Distilled water.....	2 ounces
Oil of wintergreen.....	8 minims

The patient should use the gum massage and gum wash at least three times a day.

But let it be again emphasized: The importance of adequate dental assistance in the treatment of pyorrhea cannot be overestimated.

## FOUL BREATH

It is rarely excusable for a person having once discovered that the breath is offensive to neglect prevention of the odor. Perhaps the most frequent cause pertains to the teeth. There may be cavities, or there may

simply be lack of cleanliness from an insufficient use of the tooth brush and the proper tooth powders, tooth pastes or mouth washes. It is also necessary to remove with a toothpick particles of food which may have become fixed between closely set teeth. All cavities should be filled and tartar deposits should be regularly removed, not only because of their likelihood to cause disagreeable odor to the breath, but of the possibility of allowing germs to develop and be swallowed. If the stomach is not in a healthy condition and the gastric juice not normal, such germs may not be killed. The proper tooth powder should be determined by the ease with which the teeth are cleaned, some requiring more friction in the powder, and others requiring more soap. The choice of the powder and the frequency with which the teeth should be brushed is determined by the results. They must be kept clean, and the cleansing must be done at least twice a day—in the morning and at bedtime.

#### TOOTH POWDERS AND OTHER DENTRIFICES

Although there are numerous tooth powders and other dentrifices available on the market, and although individual and varied claims are made for each, it is doubtful that much in the way of antiseptis or bactericidal effect in the mouth can be proved for any of them. It must be remembered that the action is evanescent and that the moment the use of the preparation is stopped the first breath or mouthful of food may bring in a host of new bacteria. However, such preparations have excellent mechanical cleansing effects and may well be utilized for the purpose.

If there is any tendency to alveolitis, or if purulent alveolitis is present, then antiseptic, followed by alkaline, mouth washes should be frequently used until the condition is cured, but if it tends to recur, then such mouth washes should be used once a day, continuously. For a time weak peroxid of hydrogen solutions are beneficial, especially if the acid, which is formed after its oxidizing action, is quickly washed away with an alkaline solution. If the gums are spongy a 5 per cent. solution of potassium chlorate makes an efficient mouth



wash. One of the best local astringents and local antiseptics is a dilute solution (perhaps one part to five) of alcohol in water.

The teeth not being the cause of the odor of the breath, the tonsils should be examined, and not infrequently little calcareous deposits will be found in one or more crypts, or there may be a pocket of caseous deposit back of the tonsil. These should, of course, be removed and the crypts treated with some antiseptic solution and a cleansing antiseptic gargle given.

Another frequent cause of bad breath is postnasal or nasopharyngeal infection. If this is a chronic condition the treatment is tedious, and unless the patient thoroughly cooperates, results will be unsatisfactory. The proper treatment of nasal and nasopharyngeal infection can only be determined by a study of the individual condition. A warm cleansing solution is, of course, always important, and the frequency of its use can only be determined by the rapidity with which the secretion forms deposits.

In atrophic rhinitis the odor is terrible, and, unfortunately, the condition is generally incurable; but there is absolutely no excuse for such a patient polluting the atmosphere of the rooms in which he works or lives. The odor can be prevented by the proper use of mild antiseptic and cleansing solutions, such as Dobell's solution. This solution is as follows:

	Gm. or C.c.	
R Phenolis .....	1	m. xv
Sodii bicarbonatis.....	3	
Sodii boratis.....	3	or āā gr. xlv
Glycerini .....	10	fl̄ iiss
Aquae .....ad	200	ad fl̄ vii

M. Sig.: Use as an antiseptic gargle or as a nasal antiseptic spray.

Other causes of disagreeable breath are constipation and dyspepsia. The cause of these conditions should be treated, and as the tongue becomes clean and the pharynx less congested the breath will become better.

Laryngeal and bronchial inflammations and catarrhs, of course, are other causes of bad breath. If the condition is acute or subacute, it can soon be improved by

proper treatment. If the condition is a chronic one, mild antiseptic inhalations will largely prevent the fetid condition.

	Gm. or C.c.	
R Creosoti .....	1	m. xviii
Olei pini silvestris.....	10	or flʒ iii
Tincturae benzoini....q. s. ad	100	ad flʒ iv

M. Sig.: To inhale a teaspoonful from boiling water, one, two, or three times a day.

### MOUTH-WASHES AND GARGLES

There are perhaps fifty mouth washes on the market. They are all more or less similar in their composition, more or less multiple in their constituency, and more or less expensive, and represent more or less enormous profits to their owners. A number of pharmacopeial and National Formulary preparations have been developed to meet the need of mouth washes and also to imitate some of the proprietary preparations.

Such polypharmacy as this is absolute nonsense. As in many pharmaceutical preparations, the value of the really useful ingredients is obscured by the useless camouflage which surrounds them.

As antiseptic for the mouth and throat we cannot improve on the carefully localized applications of the tincture of iodine or of weaker solutions of iodine; when deemed advisable, of a strong solution of nitrate of silver carefully applied locally; or of local swabbing with strong hydrogen peroxid solution, or the more generalized washing or spraying with dilute solutions (provided that hydrogen peroxid is not applied to a deep ulcer or sinus where it can possibly cause disintegration of tissue). Strong preparations of glycerin and strong solutions of alcohol are other pleasant antiseptics, and the latter is decidedly astringent.

When a strong antiseptic is used, after it has acted for a few minutes, soothing washes or sprays should be used. Also it should be remembered that any simple cleansing wash (than which perhaps nothing is better than simple salt solution in so-called physiologic strength, 0.9 per cent., or  $\frac{1}{4}$  teaspoonful of salt to about half a glass of warm water to which may or may not be added another  $\frac{1}{4}$  teaspoonful of sodium bicarbonate) is of value on an inflamed mucous membrane. After such cleansing of the membrane, the antiseptic

may be directly applied, if such is indicated, or the cleansing and soothing gargle or mouth-wash just mentioned may be all that is needed. It is not the particular preparation that is used, or the particular ingredients in the mouth-washes and gargles, but it is efficient washing and gargling that is of benefit.

The value of boric acid, not only in being mildly antiseptic, but also in promoting mucous secretion and therefore causing the easy removal of follicular exudates and membrane, should not be forgotten. Many times the insufflation of boric acid powder directly on the region involved is most efficient. At other times gargling of a solution in which boric acid is suspended is of value. While boric acid will dissolve in water only to about 4 per cent., a large surplus of boric acid should be left undissolved in the bottle. The bottle should be shaken, and the patient then gargles a boric acid solution which will deposit boric acid crystals on the throat, and will often be of as much value as though the powder were insufflated.

Perhaps the most pleasing pungent taste to the majority of patients is peppermint, and there is no reason for mixing this up with several other aromatics. If peppermint is disagreeable to a particular person, wintergreen may be substituted.

The following are formulas of a few simple solutions for mouth and throat washes:

	Gm. or C.c.	
R Acidi borici.....	2	3 ss
Potassii chloratis.....	5	or 3 i
Aquae menthae piperitae...	200	fl 3 vi

M. Sig.: Use as a gargle or mouth-wash, diluted or undiluted, as directed.

	Gm. or C.c.	
R Sodii chloridi.....	2	3 ss
Sodii boratis .....	2	or fl 3 iss
Glycerini .....	50	fl 3 vi
Aquae gaultheriae...q. s. ad.	200	

M. Sig.: Use as a gargle or mouth-wash, diluted or undiluted, as directed.

	Gm. or C.c.	
R Acidi salicylici.....	2	gr. xxv
Glycerini .....	25	or fl 3 v
Aquae menthae piperitae		
.....q. s. ad	200	fl 3 vi

M. Sig.: Use as a gargle or mouth-wash, diluted or undiluted, as directed.

The value of dilute alcohol washes, such as one part of alcohol to four or five parts of water, should not be forgotten. Alcohol is astringent, cleansing and antiseptic. Sometimes potassium chlorate solutions, though very disagreeable, are most healing when the whole mucous membrane of the mouth is more or less inflamed. If there are no pockets in which hydrogen peroxid may form bubbles and cause an extension of ulceration, there is no mouth-wash more antiseptic and more efficient than diluted hydrogen peroxid solution, and one part of hydrogen peroxid solution to three or four parts of warm water. Immediately after the use of hydrogen peroxid solutions a mild alkaline solution should be used to wash off the froth caused by the peroxid action and also to remove the acid irritation caused by such action.

If the mouth is dry during illness, some slightly pungent substance may be taken, to be either chewed or swallowed, such as some effervescing water, ginger ale, some pungent mint chewing-gum, or even a simple peppermint lozenge. Of course the value, in such conditions, of vegetable sours such as lemonade, orangeade or a piece of orange is well understood. These will increase the mouth secretions and prevent drying of the mucous membrane, which is such a frequent cause of ulceration.

Various preparations of glycerin diluted with water, with or without boric acid or borax, or boroglycerid, or milk of magnesia, are all valuable in preventing or aiding in the healing of a sore mouth.

If the tincture of iodine does not heal an ulcer or fissure, one or two applications of either the stick nitrate of silver or a 25 per cent. solution, applied by means of a swab, will generally cause healing.

If the patient is too ill for strenuous or perfect cleanliness of the mouth, as soon as convalescence is established extra care should be given the mouth and teeth.

It should not be considered that a patient has been thoroughly examined until the condition of the mouth has been investigated. As before stated, too many chronic diseases have their source and continuation from diseases of the gums or from neglected, decayed teeth, to say nothing of diseased tonsils. A fetid, bad



breath should always be investigated, as it is generally due to chronic inflammation in the mouth. While a large portion of adults over 40 have more or less pyorrhea alveolaris, a large number of these patients may have the conditions entirely prevented, and by various methods to-day many patients are cured of what was long considered an incurable condition.

The foregoing of course are only suggestions, and each physician should order the mouth-wash that he desires for his patient as carefully as he would write any other prescription. There is nothing wonderful or mysteriously curative in any of the formulas described, and simple home remedies will often be as effective as an expensive proprietary preparation, unless an antiseptic is required. Even simple starch water makes a very soothing gargle.

### CARE OF THE TEETH

It has too long been believed that a serious illness caused of itself degeneration of the teeth, either cavitation or actual loss. While there are many of the elements of nutrition that are needed for the teeth to remain healthy, neglect of the mouth and teeth is probably the larger factor in their degeneration. Tartar forms, inflammation begins and pus-pockets develop around the teeth when they are not properly cleansed and the gums are not properly cared for.

If the patient is so ill that he cannot allow brushing of the teeth either by himself or by the nurse, the gums and teeth should be cleansed by rubbing or spraying with the liquids selected. A great source of cleanliness for the teeth is chewing, which is more or less in abeyance during serious sickness, but we are learning that in most of the prolonged acute diseases the patient is able and willing to chew such a simple thing as dry toast. This alone cleanses the teeth, starts the saliva, and normal mucous flow, and frequently offers a better food than the constant swallowing of even nutritious liquids. If the ordinary simple cleansing lotions are not sufficient to prevent the formation of pus or ulcerations, various applications to the regions of trouble should be made, and perhaps none.

is better than the tincture of iodine, or, if that is considered too severe, a modified solution of iodine as follows:

	Gm. or C.c.	
R Iodi .....	1	gr. xv
Potassii iodidi.....	3	gr. xlv
Glycerini .....	30	℥i

M. Sig.: Use externally as directed.

Gies found that so-called antiseptic mouth-washes and alkaline washes did not wash off or dissolve the adherent mucin, and therefore are not effective in preventing decay of the teeth. He believes that the vegetable acids, such as diluted vinegar and the fruit juices and their acids, are the most successful cleansing substances that can be used on the teeth. He also believes that starches and sugars should never be eaten alone, but should be certainly followed by some acid substance, as some of the acid fruits or some of the vegetable sours. After most meals, therefore, it is good sense to eat a little fruit, and on going to bed perhaps the most successful cleanser of the teeth is a little sour fruit or diluted fruit vinegar.

Children and patients should also be taught to brush the gums as well as the teeth, and when it is needed a patient should be taught to massage the gums. The use of wooden toothpicks to remove particles between the teeth that cannot be removed by the toothbrush should be approved.

Many patients' teeth are so close together that particles of food remain lodged between them and cannot be removed in any other way. Dental floss should certainly be used occasionally, or frequently, if possible. If inflammation actually occurs in the gums or around a tooth, the advice and care of a dentist are needed.

## THE EXAMINATION OF STOMACH CONTENTS

*Test Meal.*—The object of the test meal is to show the state of digestion. For this purpose a meal consisting of ordinary food is most appropriate. It has recently been suggested that gastric secretion is sufficiently stimulated by ordinary water and in this way the gastric juice can be secured in a state of great purity, especially fit for chemical examination. While

this is true such a meal does not indicate how the stomach deals with ordinary food. For the latter purpose the test breakfast of Ewald has long been used and has proved itself very serviceable. It should be used as a routine. It consists of bread and tea or bread and water. The amount of bread should be from 35 to 50 gm. No butter, sugar, milk or spices are used. The amount of bread can be supplied by two slices of bread, a roll, or five ordinary soda crackers. The amount of tea should be two ordinary cups approximating 400 c.c. or a pint.

The meal should be taken on an empty stomach, before breakfast or in place of the noon meal. The latter time has the advantage that in case of motor insufficiency remains of the breakfast may be found in the stomach contents. In this case it is well for the patient to eat some article of food for breakfast that can be easily recognized. The test meal should be tastefully prepared and tastefully served. Such table accessories should be furnished as will make it as attractive as possible. Preparations for the removal of the contents should be made without attracting the attention of the patient. The time for removing the contents should be reckoned at one hour from the time of beginning the meal.

In some cases this time may prove too long because the lack of acid permits the contents to leave the stomach prematurely and no contents are brought back through the tube. In such a case the meal should be given again and the contents removed at the end of forty-five minutes or even a half hour.

*Removal of Stomach Contents.*—The technic of removing stomach contents is simple. The patient should be covered with an apron to protect the clothing; the physician may also find it advantageous to wear a gown. A shallow basin should be provided to receive the contents; a better arrangement is a stout glass jar known as a celery jar which should be placed in a larger basin. It is well to suggest to the patient to hold the basin with his hands. This serves to keep the hands occupied and tends to lessen the tendency of the patient to pull out the tube. The patient should be assured that the operation will not hurt; at the same time it is best to admit that it will be disagree-

able and especially that it is apt to give a sensation of difficulty in breathing, but that this will disappear if the patient breathes regularly through the nose. The tube to be used is a simple tube with one lateral opening and one at the end. To the upper end a short piece of rubber tubing is attached by a connecting short piece of glass tubing and the shorter tubing is attached by a piece of hard rubber to a strong walled bag like a Pollitzer bag. This serves as an aspirator to remove the contents by suction.

The tube is introduced by the hand of the operator holding it like a pen. It is not necessary for the hand to enter the mouth. The operator should stand partly behind the patient and may steady the patient's head with the left hand. When the tube has entered the stomach the contents may flow spontaneously; if not the flow may be stimulated by moving the tube up and down which excites some nausea. If the contents are not easily obtained the aspirator should be emptied of air and attached. When it is allowed to expand the contents will flow into the bag and can be emptied into the receptacle provided. The temptation will sometimes arise to facilitate the removal of contents by injecting water. This defeats the object of the removal as the contents obtained are practically worthless even for qualitative tests. At the termination of the process the patient should be warned against spitting in the dish containing the contents. He may spit in the outer basin.

*Examination.*—The stomach contents should be measured. The contents ordinarily secured varies from fifty to one hundred and fifty cubic centimeters; a quantity above 150 c.c. is indicative of one of two things: either there has been a retention of food remnants on account of motor insufficiency or a hypersecretion of the gastric juice has occurred. The chemical examination will usually determine this question.

The macroscopic examination of stomach contents is perhaps of more importance than the laboratory investigation. For this reason the physician should remove the contents himself. The contents should be poured into a clean basin and poured back again into the original dish. The color should be noted. A greenish color may indicate admixture with bile; it is



also sometimes due to a growth of mold or other fungi. Mucus will be recognized by the stringiness of the contents which is readily seen as the liquid is poured from one vessel into the other. Mucus may be swallowed from the throat or possibly from the chest. Such mucus is light and frothy, or in lumps which float on the surface; stomach mucus clings to the vessel and is intimately mixed with other contents. Blood may be readily recognized, but is of minor significance; it is frequently shed by the mucosa which has been injured by the tube. The mucosa is especially liable to suffer such an injury in *achylia gastrica*. The condition of digestion is easily observed by the appearance of the remnants of the roll. If digestion is good the gluten of the flour is digested and the starch sinks to the bottom as a fine sediment. If the digestion is imperfect the roll is coherent and in case of total lack of acid the bread appears as if it had just been swallowed or it may be enveloped in glairy mucus. Occasionally small pieces of mucous membrane will be found which have been stripped off by the tube.

Having noted these striking characters one should proceed to the chemical examination. Usually it is not necessary to filter the contents. A piece of congo paper may be dipped into the contents; if free acid is present the red paper changes to blue. A piece of tropeolin paper will turn brown if free hydrochloric acid is present and on drying this at a gentle heat the color will change to violet. This is usually sufficient to demonstrate the digestive power of the mixture. One proceeds at once to the titration of acids for which a determination of the free hydrochloric acid and the total acidity are sufficient for routine examinations. 10 c.c. of the contents are measured, most conveniently in a 10 c.c. graduated cylinder and poured into a small beaker glass. It is well before reading the amount in the cylinder to remove any mucus floating on the top by means of a pair of small forceps and fill up to the mark with clear fluid. After emptying the cylinder it may be rinsed with distilled water and the rinsings added to the fluid in the beaker. This is then titrated for free HCl by running in from a burette decinormal sodium hydroxid solution with dimethyl-amino-azoben-

zene as an indicator until the red liquid becomes orange yellow (not lemon yellow). The reading of the burette is then taken and one or two drops of solution of phenolphthalein are added to the liquid in the beaker. The alkali solution is then run in until the liquid shows a distinct tinge of pink after stirring. This gives the total acidity; both readings are taken from the zero point and the figures multiplied by ten to get the amount of alkali required to neutralize acid in 100 c.c. of stomach contents. These figures are customarily used in reports and are designated as the degree of free and total acidity.

The tests described above consume little time (not more than fifteen minutes for one accustomed to the work) and may suffice for the examination in the majority of cases. Some other tests ordinarily described, are not needed in ordinary clinical work because their results can be predicted from the results of tests already made. Among these may be included the following. Tests for the digestive action of the saliva are unnecessary because we may assume with fair certainty that starch digestion will be poor in the presence of high acidity, fair with normal acidity, and very good with low acidity. Tests for the presence of pepsin are unnecessary unless there is no free hydrochloric acid. In the absence of hydrochloric acid the presence and amount of pepsin should be tested for. Tests for lactic acid are quite unnecessary when there is free hydrochloric acid. When hydrochloric acid is very deficient or absent lactic acid should be tested for. Kelling's test for lactic acid may be used: Add a few drops of 5 per cent.  $\text{Fe Cl}_3$  solution to a test tube of distilled water sufficient to produce a faint yellow color. Divide this into two parts. Keep one for comparison. To the other add a few drops of the gastric juice. A distinct canary yellow color appears if lactic acid is present. If the total acidity is as low as 8 the probability of achylia gastrica may be assumed.

*Microscopic Examination.*—For examination with the microscope a drop of the contents is placed on a slide and examined with a low power. It can advan-

tageously be stained with a weak Lugol's solution. Starch is colored blue, proteins yellow, and some bacteria blue. The objects of interest are Oppler-Boas bacilli, long bacilli often bent on themselves, sarcinae masses of cocci aggregated in groups of eight with divisions between the individual cocci which cause the mass to look like a fleece of wool, yeast cells and starch granules.

### EXAMINATION OF FECES

The examination of feces is of little value so far as the diagnosis of indigestion is concerned unless a definite diet is prescribed so that one may know what appearances the residues of the food should present under normal conditions. The original test diet of Schmidt was devised so as to conform to German dietetic customs and is ill adapted to American habits. Several modifications of this diet have been proposed, among them the following menu by Dr. M. M. Scarborough.

Breakfast:—One soft boiled egg, 2 slices of toast with butter, 1 bowl of oatmeal with sugar and cream, 1 glass of milk, and 1 cup of coffee. If coffee is not desired, another glass of milk may be substituted.

Dinner:—A quarter pound of finely chopped round steak (very slightly broiled so that most of it is rare),  $\frac{1}{2}$  pound of mashed potato, 2 slices of white bread or toast, plenty of butter, and 1 or 2 glasses of milk.

Supper:—Same as the breakfast.

A patient is put rigidly on the above diet for three or four days. At the beginning of the diet he is given a tablet or capsule containing 0.30 gram (5 grains) of pure willow charcoal. This dose of charcoal is repeated at the end of the diet. The consequent black stools from these two doses of charcoal will mark the beginning and end of the period of special diet. The length of time it takes the charcoal to go through the intestines will determine their activity and whether the food is delayed or not in its passage through the alimentary tract. The second dose of charcoal is useful only to determine whether the activity of the canal has changed during the rigid diet. The stool which is to be taken for examination should be at the end of

the third 24-hour period of the diet and before the administration of the second dose of charcoal. The stool desired may be collected in a wide mouthed jar or what is more convenient for the ordinary examination, a sample may be transferred to a glass ointment jar and transmitted to the laboratory for examination. The examination may be divided into macroscopic, microscopic and chemical.

*Macroscopic Examination.*—Macroscopically, under normal conditions, we find a soft-formed stool, light-brown in color and of uniform consistency. A liquid stool usually denotes a too rapid passage of food through the tract; a tarry stool indicates blood coming from the stomach or high up in the intestine. Flakes of mucus, blood, pus, etc., are pathologic. Next a piece of feces the size of a walnut is ground up in a mortar with a little water and then spread out on a glass plate in a thin layer. The plate should be placed over a sheet of paper half of which is white and half black. The normal feces appear perfectly homogeneous except for here and there small broken, brownish points of cellulose from the oatmeal eaten. In this preparation may be seen food remains which are abnormal. Firm, whitish or yellowish strings of connective tissue, and small brown-colored rods of muscle fibre, appearing like splinters of wood, may be seen here and there, denoting improper indigestion of the meats. Starch granules in the form of glassy transparent globules like sago grains, may be present and must be distinguished from shiny, ragged flakes of mucus.

*Microscopic Examination.*—The microscopic examination is very simple. A small mass of feces is pressed out in a thin layer on a slide by means of a cover glass. A little water may be added if necessary. Normal excrement from the test-diet appears as a fine detritus of granules, globules and bacteria interspersed here and there with fragments of muscle fibers, small, irregular, yellowish flakes of calcium salts and less numerous skeletal remains of potato cells, besides the chaffy particles from the oatmeal. On a second slide a small piece of feces is stirred up with two drops of a 35 per cent. solution of acetic acid, heated over a flame until bubbles arise, and then set to cool. The



process causes a liberation of the free fatty acids which flock out on the surface of the preparation, giving a rough index to the amount of fat in the stool.

On a third slide an iodine solution (liquor iodi compositus, Lugol's solution), diluted with equal part of water, is used, which stains the starch, yeast and other fungi that may be present. The microscopic examination may reveal the following pathologic components: fragments of muscle fibres large in size and in good state of preservation; clusters of undigested starch grains; numerous needles and crystals of fatty acids and soaps; and occasionally various fungi.

*Chemical Examination.*—The chemical tests are very simple. The litmus reaction is taken; normal stools are faintly alkaline or at least feebly acid. Next a little of the stool is mixed with a strong bichlorid solution (a saturated solution of corrosive sublimate in water, which is, in cold water, not far from 7 per cent.); normal feces give a red reaction, while feces that have passed through the tract so rapidly that the bile has not been reduced to give a greenish color. The greenish color is abnormal and shows that unchanged bile pigments have passed entirely through the intestinal tract. The last test is the amount of gas that the stool will give off. An acid stool with an excess of carbohydrates will ferment if kept warm and give off considerable carbon dioxide; on the other hand a stool which gives an alkaline reaction and contains much unabsorbed protein will readily undergo putrefaction and evolve ammonia and hydrogen sulphid. The gas from decomposing feces can be collected by filling a large test tube with diluted feces and inverting the tube over water in a shallow dish and placing in an incubator for a day or two.

*Pathologic Findings.*—The significance of pathologic findings are briefly as follows:

Mucus in the stool means inflammation of the colon or rectum. Rarely it may come from the small intestine. A green color with the bichlorid test indicates a very rapid passage of intestinal contents. Absence of bile pigment denotes complete obstruction of the biliary duct. The pigment may be obscured by excess

of fat, which should be removed by ether before a final opinion as to the absence of biliary pigments should be expressed.

The finding of meat remains is of great significance. Connective tissue never appears in the feces after the test-diet unless there is disturbance of digestion in the stomach, a diminished gastric juice. Muscle fibers are not digested in the stomach, but in the intestine. Even in complete achylia gastrica the muscle fibers may be completely digested leaving the connective tissue skeleton of the meat unaffected. The presence of muscle fibers in a good state of preservation always means trouble in the small intestine, due to one or more of the following conditions: the pancreatic juice may be insufficient; or the active enterokinase of the secretions of the small intestine may be absent; or finally, there may be a marked hypermotility, too rapid peristalsis, of the small intestine, thus not allowing time for digestion of these elements. A method for the investigation of the exact cause of intestinal indigestion of meat fibers has not yet been satisfactorily worked out. However, as the nuclei of tissue cells are digested only by the pancreatic secretion, Schmidt has devised his nuclei test which consists in giving a small cube of meat placed in a small porous silk bag. The bag almost always contains remains of the tissue after passing through the gastro-intestinal tract. If undigested nuclei are present, it is safe to conclude that there is an unsatisfactory functioning of the pancreas.

The presence of starch elements indicates its incomplete digestion in the small intestine and shows a disturbance of the pancreatic secretion and of the intestinal juice. Insufficiency of starch digestion is further confirmed by the fermentation test and by the finding in the stool of organisms that stain blue or violet with iodine.

In the feces of constipated persons, as a rule, there are few food remnants, few bacteria, and water has been largely absorbed rendering the feces dry and hard. Digestion in the constipated may be said to be too good.

## DIAGNOSIS AND TREATMENT

The diagnostic findings and the indications for treatment may be summed up as follows :

1. If the charcoal is slow in passing through the alimentary canal, i. e., more than thirty-six hours after ingestion, intestinal peristalsis is sluggish.

2. If the fecal matters are very dry, there is too great absorption of liquid from the intestines.

3. If the stools are very liquid, there is generally too rapid peristalsis.

4. If the fecal matters are distinctly or very acid, there is an imperfect intestinal digestion.

5. If there is much gas in the feces, there is maldigestion of some kind ; it may be purin maldigestion or carbohydrate maldigestion. Whichever it is determined to be, that particular kind of food should be limited.

6. If there is undigested connective tissue found microscopically, the trouble lies in the stomach, which should then be studied by means of the test breakfast and examination of the stomach contents withdrawn an hour after the test breakfast has been taken. If there are undigested muscle fibers present, there is insufficient pancreatic secretion, and meat should be diminished or temporarily withdrawn from the diet.

7. If there is a large amount of undigested starch particles, the pancreatic juice is deficient, at least in its starch digestion properties ; consequently the starch in the diet should be diminished.

8. If the bile pigments are absent, of course the bile is not secreted (or excreted) into the alimentary tract. If there is a large amount of fatty acids, or if there is a large amount of fat in the stool, it shows deficient bile secretion, and the amount of fat ingested should be greatly diminished.

9. Abnormal bacteria, or an abnormal amount of bacteria, or specific bacteria would suggest various diets, bowel antiseptics, purgings, and various systemic treatments, depending on the findings.

10. Much mucus or pus would suggest the treatment, depending on the region from which it was supposed to come; colon washings or colon treatments, if the colon was at fault.

11. If there is blood in the stool, evident or occult, it must be determined, if possible, from what part of the tract it comes.

#### THE FINDING OF PATHOLOGIC OVA

Fauntleroy and Hayden (*Abstr. Jour. A. M. A.*, Feb. 13, 1915, p. 620) have devised a method which consists essentially of staining the fecal matter with anilin gentian violet. This solution stains everything on the slide except the eggs. It does not penetrate the membrane about the eggs and they are therefore left in a natural state. None of the other ordinary colored stains will do this. The entire slide with the exception of the real eggs is stained violet. This method of examination has been used in the examination of over a thousand stools with uniform success. All eggs, hookworm and others, stand out very clearly and beautifully. About 2 gm. of the fecal material are thoroughly mixed with 5 c.c. of a 2 per cent. aqueous solution of compound solution of cresol in a centrifuge tube. The specimens are centrifugalized at high speed for one minute, the supernatant liquid is then decanted and fresh compound cresol solution added and mixed with the sediment in the tubes. This operation is repeated three times. On completion of the centrifugalization process a small portion of the bottom sediment is removed with a clean pipette and placed on a clean slide, a small drop of anilin gentian violet mixed with the sediment, and a clean cover-glass placed on it. See also description of methods under "Hookworm."

#### INTERPRETATION OF SYMPTOMS REFERABLE TO THE STOMACH

There is perhaps no group of symptoms regarding which there is more misapprehension among physicians than symptoms arising from the stomach or felt in the region of the stomach.



## INDIGESTION

Indigestion is a much abused term commonly used to cover all forms of stomach disease. Strictly it means the non-digestion of food. This is a rare event among those who are not seriously ill. That digestion may fail in the stomach or in some other part of the alimentary canal or that some parts of the food may escape digestion is common enough, but the human organism is provided with compensating mechanisms so that if one organ in the digestive system fails to perform its duty another is usually capable of taking its place. As a rule in adults, even in the case of those who complain of trouble with the stomach or bowels, only a minimum of the food ingested escapes digestion or fails to be absorbed. The test of digestion is found in the state of the bowels; if the bowels act normally or are constipated as a rule the digestion is complete and may indeed be too good. If there is diarrhea it may be assumed that digestion is imperfect, although there may be no lesion of the stomach or intestines. We may repeat that indigestion is not a common symptom in the ordinary chronic affections of the stomach and intestines. As a corollary of the above we may affirm that digestive ferments are not often lacking and there is rarely a rational indication for prescribing artificial ferments to supply a lack in the normal action of these organs. Such drugs should be prescribed only after their deficiency has been shown by the proper tests.

## THE IMPORTANCE OF STOMACH DIGESTION

It is not desirable to over-rate the importance of the processes going on in the stomach in the final process of digestion. The stomach is a preparatory digestive organ. It is a reservoir which reduces the food to a fine state of subdivision and renders it suitable for the subsequent action of the secretions of the liver, pancreas, and intestines. Its work is seldom complete. The organ may be removed or fail to perform its functions without any serious disturbance in nutrition. Nevertheless one cannot deny that changes in the utilization of food may occur in the

absence of the correct functions of the stomach which, in the long run, may seriously affect metabolism and nutrition. In this connection we may note some peculiarities of the motor action of the stomach which have important bearings on treatment. The stomach does not absorb water and hence in case a liquid which needs no digestion is taken, even at meal time, a special channel is formed along the lesser curvature by which the liquid is conveyed to the intestine without mingling with more solid undigested contents of the stomach. The taking of liquids at meal time does not, therefore, dilute the gastric juice as was formerly taught. Such an event may happen, however, when the stomach is atonic and allows water or other liquid to flow into the lower part instead of conducting it into the intestine in a normal manner.

#### RELATION OF THE STOMACH TO OTHER ORGANS

It should always be borne in mind that the stomach has important nervous connections with other organs by which it reflects like a mirror events taking place in other parts of the digestive system. Symptoms apparently arising in the stomach may, in reality, depend on disease of the liver, gall-bladder, appendix, or lower bowel. Neighboring organs not connected with the process of digestion or even remote organs may produce a reflex disturbance in the stomach. A very large part of the disturbances of the stomach is of psychic origin. The physician should always interpret the symptoms presented by the patient who thinks there is something wrong with his stomach in the light of possible disease of other organs or of mental disturbances. Even in the presence of proved organic disease the possible influence of emotion in producing symptoms should not be forgotten.

#### THE MAJORITY OF STOMACH CASES FUNCTIONAL

While the existence of serious organic disease should never be overlooked it is well to understand that only a small proportion of patients who come to the physician complaining of the stomach or of digestive disturbances have ulcer or cancer. The

physician should not make or suggest a diagnosis of serious disease until he has proved its existence by appropriate physical and laboratory examinations.

#### SYMPTOMS NOT CHARACTERISTIC

Diagnosis on the basis of the patient's recital of symptoms without physical examination or the analysis of a test-meal or of the feces is much too common. It may be said at the outset that there exists scarcely a symptom that is characteristic of any definite stomach disease. This may explain the readiness with which practitioners resort to such terms as indigestion, dyspepsia, catarrh of the stomach or the indefinite term "stomach trouble" to explain their diagnosis to the public.

#### THE RARITY OF FERMENTATION IN THE STOMACH

Formerly it was a favorite custom to explain the belching of gas from the stomach and the flatulent distention of the organ, as also the "sour" stomach, by saying that these symptoms arose from the fermentation of the food. Such an explanation gave rise to attempts to suppress fermentation by giving a host of antiseptics, some of powerful and some of feeble germicidal power. This explanation and the practice based on it arose from the application of a chemical theory without sufficient regard for the actual conditions prevailing in the stomach. The contents of the stomach are at times subject to fermentation with the production of a certain amount of gas. Lactic acid may be formed by fermentation, but usually no gas is formed with it; butyric acid may occur in the stomach contents and its formation is accompanied by the evolution of some gas; yeast fermentation forms gas at times. However, if one will watch one of these fermenting liquids he will find that ordinarily the formation of gas is slow and quite insufficient to account for the belching that many patients experience. These occasional sources of gas account for its accumulation only in rare cases. In the majority of cases the gas present in the stomach consists of swallowed air. As a rule, even in cases in which much distress is produced by flatulence or belching, there

is no fermentation in the stomach. The swallowing of air may be a habit of voluntary origin or it may arise from the forcing of air through an atonic cardiac orifice by the force of expiration. The acid present in the stomach contents is seldom the result of fermentation but is produced by oversecretion of the gastric juice. It is well, therefore, to ascertain the true origin of these symptoms before attempting to prevent them by the administration of injurious antiseptics.

### ACUTE DYSENTERY

Acute dysentery or colitis is an inflammation of the large intestine, throughout either the whole or a portion of its extent. Sometimes the lower part of the small intestine is coincidentally inflamed. The disease may be due to various irritants of microbic or parasitic origin, giving essentially similar symptoms but requiring different treatment addressed to the cause of the disease. As Mathieu remarks, we should not speak of dysentery but of "dysenteries," as there are several kinds of dysenteric colitis. It is, however, convenient to discuss the symptoms and general treatment in common for the different varieties and then take up the specific treatment of the different forms.

The disease is characterized by mucus, blood and purulent discharges from the rectum, accompanied by much straining, colicky pains and tenesmus. The following classes of dysentery may be noted: bacillary dysentery, amebic dysentery, balantidium dysentery, and dysentery arising from some unknown infection. The disease is, therefore, infectious, and may be transmitted by the discharges or articles contaminated with them. It occurs in epidemics and also sporadically. When dysentery occurs sporadically it is generally more amenable to treatment.

### SYMPTOMS

The general symptoms of acute dysentery are mild fever, a variable pulse, at times rapid or weak from exhaustion, with a tendency to collapse turns; the movements are frequent and exhausting. The nearer the rectum the inflammation is, the more intense is the tenesmus and the more constant the desire to strain,



with resulting small movements and but little relief. The higher up the inflammation is in the large intestine, the more frequent the griping and abdominal pain. The stools consist of large masses of mucus mixed with feces, and later mucus, more or less blood-streaked, perhaps without any fecal matter at all. Later, slight hemorrhages occur, depending on the amount of ulceration or erosion of the membrane, and finally pieces of membrane are passed similar to diphtheritic membrane. The tongue is coated, but generally moist, unless a large amount of fluid is lost. If the progress of the disease is unfavorable, the temperature is likely to rise high, otherwise it remains low. If the disease long continues and the movements are frequent and profuse, a typhoid state develops.

#### GENERAL PRINCIPLES OF TREATMENT

It is evident that the first steps in the treatment are rest, the removal of irritants, and the giving of most easily assimilable nourishment. These principles apply to all forms of dysentery. The patient should be put to bed and the use of the bed pan insisted on. If the condition of the patient will permit the rectum should be inspected with a speculum or with a proctoscope and a piece of mucus or a scraping from an ulcer if any are visible obtained for examination. This should be examined immediately on a warm slide for amebae which are recognized by the ameboid movements. If no amebae are found the mucus and feces should be examined bacteriologically for other causes of dysentery. Following this examination the rectum and colon should be irrigated with physiologic saline solution. After the fecal matter and mucus have been washed away and the water is returned clear, the colon may be treated with a weak permanganate of potassium solution, 1:10,000. In making these irrigations the tube should not be pushed too far, which might increase the injury to the rectum. A few inches is sufficient. Such irrigations may be repeated once a day in the early stages.

*The Diet.*—The diet should consist of rice water bouillon, beef juice, chopped beef, or other suitable liquid food. If the tongue is coated, the other foods

mentioned agree better than milk, but if the tongue is clean give milk either alone or diluted with some of the other foods. The food must not be hot or cold. Milk predigested with pancreatin may obviate the tendency to the formation of an undue amount of intestinal gas.

If milk is desirable but is distasteful, it may be diluted with Vichy; or the milk may be given hot and salted. Preferably it should be pasteurized. Tea and coffee may be allowed at such times of the day as not to disturb the sleep. While large amounts of water are inadvisable and iced water should not be given, still, if much water is lost by the stools, the amount must be equaled by that which is ingested; otherwise the patient's tissues lose water, the blood vessels lose water, the urine becomes concentrated, the skin dry, and the patient suffers from this deprivation of water. Such a condition alone may be the cause of death. Preferably, liquids or foods should be given hot, as anything cold entering the stomach is likely to start peristalsis. It may be advisable to give some thin cereal gruel once a day, at least if the disease lasts more than a week.

As soon as convalescence is established, broiled lamb chops, roast beef, and the white meat of chicken may be added to the diet. All solid food should be thoroughly masticated and the digestion may be hastened by giving a few drops of hydrochloric acid directly after meals. As convalescence progresses favorably, toast, stale bread, and boiled rice may be added to the diet and, later, baked potatoes. The first fruit that is allowable is either lemon or orange juice.

#### MEDICINAL TREATMENT

It is generally advised to give at once a dose of castor oil or a dose of calomel with additional laxative treatment in the form of saline laxatives if necessary.

Bismuth subcarbonate may be administered in large doses, but the value of this is often problematical. However, if the inflammation is in the cecum or has migrated into the ileum, the bismuth is of benefit.

Bismuth, however, must not be too long continued, as it tends to form scybalous masses and cause more irritation and more inflammation.

Pain and too frequent movements should be stopped by small doses of morphin. Tenesmus is relieved by small ice water enemas or by suppositories of morphin and atropin.

Kaolin or bolus alba has been recently revived as a remedy for dysentery. This treatment was in vogue more than a century ago but fell into disuse. It is claimed that the powder encloses the bacteria and prevents their pathogenic action. Probably this drug has an action in every way similar to that of bismuth in forming a protective coating to the mucous membrane.

#### TREATMENT OF BACILLARY DYSENTERY

The microscopic examination may show any one of a number of already classified dysentery organisms; for example, the Flexner, Shiga, and other types. Such examination should include fermentation tests and other biologic reactions as well as a study or morphology. The classification, while a matter of great scientific interest, is not, however, an important guide for the prognosis or treatment.

The general treatment already outlined is applicable to bacillary dysentery. Certain special measures also may be followed.

Antidysenteric serum may be administered. A reduction in the mortality rate of bacillary dysentery from 30 to 50 per cent. through the use of some serums has been reported by some observers but not confirmed by all. Several forms of such serum are now available. It is customary to use 10 c.c. as a prophylactic dose. In the treatment 50 c.c. to 100 c.c. are given intravenously, a polyvalent serum being used. The dosage may be repeated later as the condition of the patient warrants.

Nolf found the specific serums to have little virtue but achieved excellent results with vaccines made of Flexner and Shiga type bacilli.

If the disease progresses and immediate healing of the inflammation does not occur, and actual ulceration seems to have developed, as shown by the amount of

bleeding, an occasional irrigation of nitrate of silver, 1 part to 1,000, not more than 1 pint at any one time, viz., 0.50 gram ( $7\frac{1}{2}$  grains) to a pint of water, is of benefit. Such an injection should be given but once in four or five days, and if the liquid does not immediately flow out of the colon a solution of salt should be immediately injected. The salt forming an insoluble sodium chlorid, will prevent any poisonous absorption of nitrate of silver.

#### TREATMENT OF AMEBIC DYSENTERY

The diagnosis of amebic dysentery should always be confirmed by a competent study of the morphology of the organism isolated, as well as the injection of the organisms into the rectum of kittens.

The general treatment of amebic dysentery is the same as that of bacillary dysentery.

The specific treatment of amebic dysentery, which is comparatively recent, is with the aid of ipecac and emetin.

Whether the amebae are on the surface of the mucous membrane, deeply embedded in the ulcers, or localized elsewhere in the body, they may be reached by properly administering ipecac and emetin. The amebae on the surface of the mucous membrane are not likely to be affected by emetin administered hypodermically. On the other hand, emetin given hypodermically becomes more quickly active on the deep seated organisms and the localized lesions. Jones reports the following method of administration is used at the Army hospital in Manila:

Emetin hydrochlorid 0.008 gm. by hypodermic for ten days (twice a day for four days and once a day for six days). Ipecac started about the eighth day with from 1.5 to 2 gm. doses given at bedtime, continued for three consecutive nights and thereafter decreased by 0.3 gm. each consecutive night. The disagreeable effects of the ipecacuanha were never manifested. It is quite necessary to precede the administration of ipecacuanha by a hypodermic of  $\frac{1}{8}$  gr. of morphin.

Happy though the results of this combination may be in treating amebiasis, the fact should not be over-



looked that emetin is an amebicide and has little to do with the healing of ulcerations. Every case of amebiasis should, after this treatment, be considered one of ulcerative colitis and so treated from a dietetic point of view. At the same time every effort should be made to enhance resistance by change of climate, tonics, etc., to obviate the distressing sequelae characteristic of the disease.

It should be remembered that even after the amebae have been removed, there still remain unhealed ulcers. These should be treated by rest in bed, proper diet and local irrigations. The latter serve not only to promote healing but also act to prevent relapses.

Sulphate of quinin is believed by many to be specific in its destructive action on the amebae, and is much used for irrigating the rectum and colon. It should be used in a 1 to 5,000 to 1 to 1,000 solution. Cures are believed to have been effected by such irrigations in many cases.

Bates, who has treated a great many of these patients successfully in the tropics, has outlined the treatment as follows: Complete rest in bed. Give a saline purge or other cathartic; give  $\frac{1}{2}$  grain (.032 gm.) injections of emetin daily until two grains (.13 gm.) are given; then increase the dose to 1 grain (.065 gm.) daily until stool is clear of amebae. Usually a total of 5 (.32 gm.) to 6 grains are required. Discontinue emetin and give large doses of bismuth subnitrate; one dram (4.0 gm.) every four hours during waking hours until stools are well formed or some constipation supervenes; then decrease dosage gradually. As soon as effects of saline purge wear off begin enemas of saline solution, two or three quarts at a time every four hours during waking hours. Discontinue when beginning with bismuth, using only once or twice a day to counteract constipation. As food give sweet milk every two hours during the day in quantities of from four to eight ounces. As improvement continues gradually add soft diet, as poached eggs, slice of dry toast, etc.

During the Civil War, according to Leidy, and subsequently as noted by Brem, and by Lawson, ipecac has been given by rectum with excellent results in persistent cases. From 60 to 120 grains are dissolved in

hot water which is kept almost, but not quite, at the boiling point for one hour. Twenty-four ounces of hot water are used. This is then cooled to body temperature and injected slowly into the rectum which has first been thoroughly cleansed by enemas of hot water. The patient retains the ipecac enema as long as possible.

Several observers have suggested the use of oil of chenopodium in much the same way as it is administered for hookworm disease.

If, in spite of the remedies which have been enumerated, the case still continues rebellious, resort to surgical interference may be deemed advisable, and appendicostomy may be performed, and irrigation of the colon by means of the insertion of an irrigation tube through the appendix may be practiced. This, however, is a measure almost of last resort.

Great care and patience are required in the treatment of this disease, and the treatment should be long continued, and after the patient is apparently cured, he should be kept under observation for months in order that, if a relapse occurs, treatment may be promptly instituted.

Abscess of the liver is a not infrequent complication. Such cases usually recover with emetin treatment if it is instituted early. It may be necessary, however, to open and drain, especially in the event of secondary infection.

Physicians should not temporize with inefficient medical treatment in severe cases of dysentery. There is a possibility of obtaining curative results by prompt surgical measures such as appendicostomy, etc., which may be lifesaving.

### CHOLERA

Cholera, which is infrequent in the United States, has been more widely spread in Europe, due to the traveling of large bodies of troops.

### PREVENTION

Each person can effectually protect himself against cholera by extreme cleanliness and avoiding unboiled water and uncooked foods. The most important gen-

eral prophylactic measure is the isolation of the sick. The disease starts almost always with diarrhea, and although the patient may still feel quite well he is already scattering germs in his numerous stools. Even before it is possible for bacteriologic examination of the stools, the leukocyte count and blood-picture may reveal the presence of cholera infection.

Before eating and especially before preparing food the hands should be thoroughly cleansed with soap and water. The face and particularly the mouth should not be touched by the hands. All fluids should be boiled before drinking. If water has to be taken raw, the danger of infection can be materially reduced by adding a little acid, a knife-tip of citric acid to a pint, or 20 drops of liquid phosphoric acid. The linen and the dejecta from the sick require, of course, thorough sterilization. There is no transmission of cholera, typhus or dysentery through the air.

#### TREATMENT

Diarrhea should be checked but castor oil may be given to govern the bowel movements and bismuth subcarbonate to sooth the intestine is useful. Morphin is often needed.

Brachio, in a recent severe epidemic in Europe, found iodin extremely effective, the best method being an intraperitoneal injection of a mixture consisting of iodin  $\frac{1}{4}$  grain, potassium iodid  $\frac{1}{4}$  grain, distilled water, 20 m. In almost all cases the treatment was supplemented with a free use of epinephrin, dropping the solution on the tongue. Naamé has shown a striking analogy between the cholera syndrome and the symptoms from defective functioning of the suprarenals. He injects epinephrin subcutaneously in doses of 4 to 6 gm. in twenty-four hours, over several days, supplemented by saline infusion.

Recognizing that the loss of fluids from the tissues through vomiting and copious evacuations in the acute stage constitute the chief danger in this disease, Rogers has recommended rectal injections by the drip method of physiologic saline solution. This is kept up until the kidneys act freely. If the blood pressure is low this may be given intravenously.

## GASTRIC AND DUODENAL ULCER

Ulcers occurring in the neighborhood of the pylorus, either on the lesser curvature in the pyloric antrum or in the first part of the duodenum, are probably due to similar etiology and have the same general character. They may, therefore, very properly be considered under the same head. Their causation is to be found probably to some extent in abnormal conditions affecting the nerves, the motor activity of the stomach and duodenum, the character of the food and the acidity of the gastric juice. Rosenow has found streptococci which he believes are specific in causing gastric ulcer, having a special affinity for the gastric mucosa. An acute loss of the mucosa in a healthy stomach is rapidly repaired; an acute ulcer of the stomach commonly gets well rapidly. A chronic ulcer behaves differently, indicating that there is some complicating factor to keep it from healing. Considerable experimental work has been done to show that the nervous supply of the stomach is necessary to maintain a healthy condition of the mucous membrane. Further, the experimental work seems to show that a thrombosis of the blood vessels or an "infection" of an area of the mucosa is sufficient to cause the destruction of a portion of the mucosa and institute an ulcer. Ulceration thus produced is favored and the necrotic tissue digested and carried away by a gastric juice of a high degree of acidity. A very marked influence prolonging the existence of such a lesion is the occurrence of pyloric spasm and the retention of the remnants of food and gastric contents containing a large percentage of hydrochloric acid. In such cases the layer of protecting mucus is digested away and the ulcerated mucous membrane is exposed to long continued action of highly acid and irritating gastric contents.

The process of ulceration in the stomach, in the light of our present knowledge, may involve the following steps: initial weakness or predisposition of the tissue; initial injury in the form of abrasion, thrombosis, or necrosis from infection; removal of necrotic tissue by active gastric juice; recovery in a normal



stomach, but in the presence of pyloric spasm or of gastric stasis and the continued action of irritating food or secretions a continuance of chronic ulceration. In addition anemia must be put down as a complicating condition, although not always present.

#### FOCAL INFECTION

In the treatment of gastric and duodenal ulcer the experiments of Rosenow indicated the wisdom of thorough search for foci of infection and their removal if possible. This is especially important in the prevention of a possible recurrence.

#### SYMPTOMS

The symptoms of gastric ulcer are various, but a certain number have been considered classic and should be kept in mind by the physician as the basis of a diagnosis. At the same time the practitioner should bear in mind the fact that any of these signs may be absent or may fail to present their usual characters. The principal symptoms and signs are pain, vomiting, hematemesis, melena, tenderness of the epigastrium, tender points near the spine; hyperchlorhydria; and roentgenographic findings showing defect in pylorus mucosa or duodenal cap.

Pain in gastric ulcer occurs in attacks with intervals, sometimes of days or longer, and is excited by the digestive process; it does not occur immediately after taking food, but corresponds to the period of high acidity. It is aggravated by coarse foods, but often relieved by the taking of bland foods or of alkalies. The pain is referred to the epigastrium but this does not necessarily indicate the exact location of the ulcer.

Vomiting is likely to occur after the taking of food and has little that is characteristic about it when it does not contain blood.

Hematemesis, or the vomiting of blood, is an important symptom and when the other symptoms are present it may suffice to confirm the diagnosis of gastric ulcer. It must be remembered, however, that blood may be vomited after it is swallowed from pulmonary hemorrhage, or it may be shed into the stomach from

the bursting of a branch of one or the radicles of the portal vein or from an esophageal varix. The latter forms of hemorrhage are sometimes the result of high blood pressure in the portal circulation in hepatic cirrhosis, etc.

The presence of large quantities of blood in the stools may be discovered macroscopically by their dark, tarry character. Such a condition of melena is corroborative of the diagnosis of gastric ulcer, but other symptoms should be present to indicate that the stomach is the source of the bleeding before we should give the mere presence of blood in the stools much weight in the diagnosis of gastric ulcer.

A tender point in the epigastrium is found in most cases of gastric ulcer. It corresponds to the location of the solar plexus and is elicited by slight pressure with the finger, differing in this respect from the tenderness due to neurasthenia, which requires considerable pressure to develop it. The tender point in ulcer is referred to a point about midway between the ensiform cartilage and the umbilicus, the point being constant in one locality and strictly circumscribed.

Nearly as constant and quite as characteristic are tender points felt sometimes on both sides, sometimes only on the left, in the dorsal region near the spinous processes of the tenth to twelfth vertebra. The disappearance of these tender points during treatment for ulcer is a valuable indication that the patient is improving.

The diagnosis of gastric or duodenal ulcer may be confirmed by the roentgen ray when observed by repeated pictures or by fluoroscopic observation. Test meals afford only corroborative evidence of the existence of an ulcer. Excess of free hydrochloric acid is usually present. There is frequently evidence of delay in evacuation of the stomach contents, and blood, either macroscopic or occult, is present in the majority of cases. The presence of occult blood in the stomach contents is not pathognomonic. Macroscopic bleeding may be due to injury of the mucosa by the stomach tube. The roentgenographic findings are gradually assuming increasing importance and while

they should not be considered pathognomonic, they may be considered almost positive when the other findings mentioned are also present.

Occult blood in the feces is of more importance. If not constantly found, it is a strong indication of ulcer, presumably in the neighborhood of the pylorus.

As Cheney points out (*Jour. A. M. A.*, 72, 1429, May 17, 1919) the diagnosis involves differentiation from chronic appendicitis, chronic cholecystitis, gastroparesis, gastric cancer, and other less important ultra-abdominal conditions such as tapeworm or hernia. It is well known that the gastric crises of tabes may simulate ulcer.

#### ULCER OF THE DUODENUM

The principal symptom is pain, more or less localized in the region of the pylorus, intermittent, occurring generally about two hours after a meal. In other words, this pain occurs when the stomach is more or less empty. This pain is more frequently relieved by eating some bland food or drinking milk than is the pain of ulcer of the stomach. The appetite is generally good, and vomiting and other symptoms of gastric indigestion are infrequent. Attacks of diarrhea may occur, and occult blood is often present in the stools. There may be marked hyperchlorhydria.

#### TREATMENT

One of the chief factors in the continuance of ulcer seems to be the irritating gastric contents which owe their irritating properties largely to their acidity. Hence the acid secretion should be reduced as a first step by regimen, diet and remedies.

Not only should the degree of acidity be determined and a search made for any other condition of the stomach which might cause chronic irritation, but the condition of other organs should be interrogated for other possible cause of hyperacidity and proper treatment should be applied. Medicinally the best remedies are alkalies combined with bismuth; thus one may give

	Gm.	
R Magnesii oxidi.....	15	
Bismuthi subcarbonatis....	15	or 3 ss

M. Sig.: Take a small teaspoonful once in three hours.

If such a powder tends to make the bowels too loose, sodium bicarbonate may be substituted for the magnesium oxid. Atropin or atropin sulphate may be given in doses of from 0.00025 gm. (gr.  $\frac{1}{250}$ ), but the use of atropin should not be continued too long.

As hyperacidity seems to increase the ulceration, certainly increases the pain, and is likely to increase the vomiting, anything that diminishes the acidity is good treatment, and a diet free from the substances that cause the greatest outpouring of hydrochloric acid is the diet of choice. In other words, a diet without meat and without meat broths, without toast, and without any hard particles of food that can scrape or irritate the inflamed part, should be selected. The Lennhartz diet with raw eggs is considered quite sensible as giving nutrition and at the same time inhibiting the production of hydrochloric acid and tending to heal the ulcer.

The raw eggs are beaten up whole and placed in a cup or glass surrounded by ice. The small amount of milk given is also served iced in the same manner, and the egg and milk feedings alternate with each other every two hours, at first two teaspoonfuls of the egg and four teaspoonfuls of the milk. The first day two eggs are used and six ounces of milk. The eggs and milk are gradually increased from this minimum until by the sixth day seven eggs and twenty-two ounces of milk are given. From the third day on a little granulated sugar is added. At the end of a week the number of eggs is reduced and some scraped beef is allowed, with soon a small amount of boiled rice. During the following week, the second week, the eggs may be soft boiled, and four may be administered a day, with the milk increased to nearly a quart, sugar as before, and scraped beef or chopped chicken and rice or bread with a little butter may be gradually added and the diet thus varied. Even when the eggs are used soft boiled, four should be taken a day. Whatever is taken, if solid, it should be very com-



pletely and slowly masticated and, as above stated, at first the amounts ingested at one time must be very small and taken at intervals of two hours during the day. The foods for the first week should be taken cold and the next week only warm, never hot. Small sips of iced water may be taken as often as desired or advisable.

In view of the hyperacidity, it is well to add to the diet as much fat as can well be borne, in the form of butter or cream.

#### SIPPY TREATMENT

The Sippy method of treatment consists primarily in protecting the ulcer from acid corrosion from the gastric juice by frequent feedings and the use of alkalis given frequently. The patient remains in bed for at least the first three or four weeks of the treatment. Three ounces of a mixture of equal parts of milk and cream are given every hour from 7 a. m. to 7 p. m. After a few days soft eggs and well cooked cereals are gradually added to the diet. After about ten days the patient is receiving three ounces of milk and cream mixture every hour, three soft boiled eggs and nine ounces of cereal each day. Cream soups of various kinds and vegetable purees, egg nog, etc. may be substituted now and then as desired. Between the feedings the patients are given powders of magnesia and soda and of bismuth and soda, to neutralize the acid secretion.

It generally seems advisable to give bismuth in large doses, at least 2 grams (30 grains) once a day. This can be taken stirred up in water or in milk and quickly drunk.

The treatment above suggested generally stops the pain. If pain is still severe morphin should be resorted to, but with this treatment it rarely will be necessary, and the dose required, hypodermatically, is small.

It must be remembered that the pain is generally caused by the free hydrochloric acid and the fact that pain disappears gives no evidence that the ulcer is healed, but the lesion may still continue in a latent state and make its presence felt by symptoms when the increased acidity of a new attack sets up renewed

irritation. Sippy's practice is to give alkali enough not only to relieve the pain, but also to neutralize all the free acid and keep it neutral during the greater part of the twenty-four hours.

The patient should not get up to urinate or for the bowels; a bed-pan should be used. If the patient is constipated the bowels may be moved by the rectal injection of a half ounce to an ounce of glycerin with an equal amount of water, and soap suds could be used if needed.

As these patients are already short on iron and for a number of days are to receive no meat, it is advisable to give the saccharated oxid of iron (eisen-zucker) 3 grains in tablet form twice a day. The patient should thoroughly crush the tablets with the teeth before swallowing.

If after a month of this treatment the patient cannot normally convalesce and be apparently cured, in other words, if the symptoms quickly return, an operation should probably be recommended as the future of such a recurrent case is uncertain. Recurrent severe hemorrhage should cause operation and of course when there is perforation operation is immediately necessary.

#### HEMORRHAGE

In case of hemorrhage from the stomach perfect quiet must be insisted on. A hypodermic injection of morphin and atropin in full dose should be administered. If the symptoms show that hemorrhage is persistent 1 c.c. (15 minims) of a 1:1,000 adrenalin chlorid solution in 30 c.c. (1 ounce) of distilled water should be given and followed in half an hour by from 50 to 100 c.c. (about 2 to 3 ounces) of a 10 per cent. solution of sterile gelatin. Ordinarily food should be withheld from 48 to 72 hours, no food being given even by the rectum. As nutrient enemata have been shown to increase the flow of gastric juice, the first enemata should be normal salt solution and later peptonized milk and egg may be used.

During the treatment of gastric ulcer the feces should be frequently examined for occult blood. When blood ceases to be present in the feces we have an indication that the healing of the ulcer is progressing

and it is justifiable to use larger quantities of food and that of a more solid character. In case bleeding reappears after it has been absent for some days this should be taken as indicating the propriety of lessening the amount and simplifying the character of the food.

Some physicians believe that morphin should never be given to relieve the pain with hemorrhage, because it tends too increase the stasis and hyperchlorhydria that is present in ulcer. Gelatin may be given or any of the other colloidal solutions such as acacia may be utilized. It may be advisable to consider seriously the question of blood transfusion or the use of some of the hemostatic preparations described under the subjects of hemophilia and purpura.

#### OPERATIVE INDICATIONS

Dr. William H. Mayo has caustically remarked that these patients should be operated on after they have had nine complete medical cures. Others have said there is no medical treatment of gastric or duodenal ulcer. The subject is one of the most debated questions in medical science today. Certainly the patient should have the benefit of the most competent advice available when the indications seem doubtful.

When there is marked tenderness at a location aside from the region of tenderness common to the ordinary ulcer or if there should be a slight rise of temperature and an increased leukocytosis one may entertain the suspicion of an approaching perforation. In such case no delay should be permitted before opening the abdomen and ascertaining the true condition. According to Billings, surgical treatment is indicated when the unhealed ulcer or the scar produces deformities which persistently interfere with gastric and intestinal function.

#### HYPERACIDITY

Practically this term means cases of increasing gastric disturbance, at various intervals after meals, or the ingestion of special kinds of food; heartburn is a common accompaniment. Tests with the stomach-tube reveal either hyperacidity or hypersecretion, and the latter may be separated into a digestive and a continuous type. The latter, when appearing periodically, is

known as Reichmann's disease or gastrosuccorhea. Pawlow's opinion that pure gastric juice has the same percentage of hydrochloric acid, must in the light of recent research be abandoned unless we assume that the superficial epithelium produces concentrated alkaline fluid, together with pure gastric juice, which is paradoxical according to Gregerson. Schmidt concludes that the stomach secretion must vary under pathologic conditions. Nervous influences come into play and the question arises whether or not there is an etiologic relationship between the hyperacidity of the stomach and the subjective symptoms. The anamnesis must not be depended on without the use of the stomach-tube. Still more important is the question whether this hyperacidity occurs as a disease dependent only on nervous causes, or whether it always has some organic lesion as a cause. The old notion that it was a pure gastric neurosis has changed on account of the rediscovery of duodenal ulcers. The purely nervous cases are less to the fore, but we would be premature in entirely denying hyperacidity in some cases as a unit *per se*.

Hyperacidity is now generally considered a symptom of disease rather than a disease itself. It frequently occurs in the sedentary and overworked and in connection with other abdominal disorders, such as appendicitis, gallstones, enteroptosis, uterine displacements, etc. It is also an early sign of the beginning of hyperthyroidism and of tuberculosis, and it may be due to ear troubles or eye-strain. It is a complex affair to deal with, and hence calls for a correct diagnosis of the causal conditions, with the removal of which the hyperacidity often disappears. In addition to these general or exciting causes, the local conditions in the stomach must be considered. Any one who has had hyperacidity for any length of time will have certain pathologic changes in the gastric mucosa, hypersecretion and hyperesthesia, and we often find pylorospasm, hypermotility or gastropptosis. Schmidt classifies hyperacidities as follows: "1. Chemical hyperacidity with a normal quantity of gastric content after a Boas-Ewald test breakfast. 2. Chemical acidity combined with hypersecretion or with a continued secretion. Here



the quantity of gastric content is abnormally and constantly large. 3. Chemical hyperacidity combined with hypersecretion and hyperesthesia. 4. Clinical or symptomatic hyperacidity with hyperesthesia. In this class of cases we have all the subjective symptoms of a chemical hyperacidity. In these cases we find a normal total acidity or even a subacidity. The symptoms are due to the hyperesthetic condition of the gastric mucosa, which is painful in a normal or even subnormal acid content. 5. In this class we may find any one or a combination of the foregoing, together with pylorospasm, hypermotility or peristaltic unrest."

#### TREATMENT OF HYPERACIDITY

The principal point is, not to confine the active treatment entirely to the stomach, but also to calm and strengthen the nervous system. Some patients are best treated by being sent at once to a hospital or sanatorium. Naturally, we try first to reduce the secretion. Atropin acts in this way, but its continuous use is not advisable, nor is that of the alkalies, which may irritate the stomach glands. Diet is very important, and foods that act as secretory stimulants, like spices, coffee, etc., should be avoided. As to special diets, it is difficult to keep them up for any length of time.

Schmidt offers the following rules: All food must be thoroughly cooked and thoroughly minced. The stomach must come to rest at least once during the twenty-four hours and the times of the meals changed to secure this. Drinking should be generally diminished and restricted to times when the stomach is not filled with food, especially in cases of ptosis. If the condition is severe or combined with ptosis, he makes the patient stay in bed for two weeks, and this he considers important. Sometimes hot compresses are used to bring relief—twice daily for two hours. At night they are replaced by cold hydropathic compresses. Washing the stomach is indicated only when the hyperacidity is based on catarrh. Temporary relief, however, will always be afforded by the administration of an antacid, and the burning, distress, pyrosis, and flatulence that may be present will all be made imme-

diately better by the administration of 1 gram (15 grains) of bicarbonate of soda. Such treatment is, of course, purely symptomatic. If it is advisable to give bicarbonate of soda, which is perhaps the best of all the antacids, three times a day, before meals, the dose should be smaller, perhaps generally 0.50 gram ( $7\frac{1}{2}$  grains). It will act, as above stated, as a gastric sedative and will soothe the irritated mucous membrane, will cause a quicker outpouring of the hydrochloric acid, and will thus hasten the completion of the stomach protein digestion; all of which will tend to make the disturbance better. If gastritis is present, no one treatment is perhaps more successful than the combination of bismuth and soda, as:

	Gm.		
R Bismuthi subcarbonatis.....	20	or	3 v
Sodii bicarbonatis.....	10		3 iiss
M. et fac chartulas, 20.			

Sig.: A powder three times a day, before meals.

Bassler has suggested the following formula:

	Gm. or C.c.		
R Magnesii oxidi.....	10		3 iiss
Bismuthi subcarbonatis....	20	or	3 v
Syrupi acaciae.....	q.s.		
Aquae destillatae.....q. s. ad	200		fl 3 viii

M. et sig.: Take one tablespoonful as required after meals, plain or in water.

A glass of hot water taken a half-hour before the meal to wash off the mucus and to deplete the inflamed gastric mucosa is, of course, excellent treatment.

If the antacid is given after a meal the digestion of the starchy foods will go on longer than usual, on account of the alkali keeping the contents of the stomach longer alkaline, viz., free hydrochloric acid or a large amount of acid peptones will not so soon be present to inhibit further salivary digestion.

If with the dyspepsia, or gastritis, constipation is present, some magnesium oxid should be added to the above prescription or substituted for the sodium bicarbonate. Also in hyperacidity the precipitated carbonate of lime is used, and is often a most successful treatment.

If an antacid is indicated and diarrhea is present, it is advisable to use lime water.

Jacobson argues that we should exclude the chlorids from the diet in hyperacidity since these are the source of acid. Even after a prolonged salt-free diet, the tissues still supply chlorin to the gastric glands. In man the gastric juice is resorbed in the intestine, and the same dose of salt can be used again indefinitely for the secretion of gastric juice. The method of attack, then, is to use a well-balanced diet save for the lack of chlorin. Foodstuffs should be either naturally poor in chlorin or freed from it by boiling.

### SIMPLE CATARRHAL JAUNDICE

This condition is due to a blocking, from more or less inflammation and swelling, of the common bile duct. While this duct alone may be involved, it is generally secondary to inflammation of the duodenum. This irritation and inflammation of the duodenum may itself be secondary to a simple gastritis, and the whole condition may be a sequence of serious maldigestion or infection and irritation from some deteriorated or toxin-bearing food. The ingestion of too much alcohol or of too much simple irritant, as mustard or rich sauces, or of some irritant drug or an irritant poison may cause secondarily the condition of simple catarrhal jaundice. In a person who has had this condition once, or is predisposed to abdominal congestions, chilling of the abdomen, either from a sudden change in temperature, or from exposure of an insufficiently clothed abdomen to cold air, may cause duodenal congestion and catarrhal jaundice.

This kind of jaundice is most likely to occur in the season of the year in which there are sudden changes to lower temperature, especially in the fall and in the early spring following warm periods. Whatever may be the exciting cause, cold frequently plays a contributing part in the development of the disease.

A true epidemic form of this disease has been termed Weil's disease, and has been accredited to a spirochete known as *Spirochaeta icterohemorrhagiae*. This is ushered in with a high fever, lasting one or two weeks, with a gradual decline in the second week, and is attended with considerable prostration. Albumin has been found in the urine, and the spleen has been

enlarged. Whether the simple catarrhal jaundice so frequently seen is a sporadic form of such an infection has not been determined. Until they have been proved to be related, it would seem well not to consider simple catarrhal jaundice as the disease described by Weil.

Simple catarrhal jaundice generally develops insidiously; rarely shows any increase of temperature, and if there is a fever it is very low, and often the temperature is subnormal; there is considerable prostration; slow pulse; entire loss of appetite; some nausea; often vomiting; and there is likely to be constipation, although there may be diarrhea. The head feels dull, or there is real headache. The tongue is heavily coated, either brown or yellow. The breath is very bad, and there is a bad taste in the mouth. There is soon bile in the urine, and there may be traces of albumin. Jaundice may be present when the patient is first seen. Soon the stools are clay colored, and the skin is dry and irritated sufficiently to cause itching. The perspiration generally stains the clothing. There is much mental depression, and inability to do mental work, but generally not much abdominal pain. The jaundice usually last two, three or even four weeks; if it lasts much longer than four weeks, some other cause for the jaundice than a simple inflammation must be sought.

The more at rest the patient is, the quicker will the jaundice generally subside. In the beginning a dose of calomel, in amount considered sufficient, should be given, followed by a saline. A gram of bismuth subcarbonate and a gram of sodium bicarbonate may be given every three hours during the day for two or three days, and then three times a day, before meals, for a few more days. The bowels must be moved daily by some simple saline or laxative water. If there is much epigastric tenderness and soreness, or if there is nausea, milk of magnesia in teaspoonful doses every three or four hours, in hot water, is advisable. The patient should be given plenty of water to drink. Hot water is also advisable.

For the first twenty-four hours, nothing but water may be given, unless food is especially desired. On



the following day the nourishment should be bouillon or hot broths, tea, toast, thin oatmeal gruel, or some other simple thin cereal. Malted milk may be given, and in another day or two a poached egg or two, if they are well tolerated. All fats and milk, except possibly skimmed milk, should be avoided in catarrhal jaundice. It is a mistake to consider milk a good food in this condition. No liquid should be given cold, and no cold food should be given; anything cold taken into the stomach in this condition is probably disadvantageous. As soon as the sodium bicarbonate in combination with the bismuth subcarbonate is given less frequently, an alkali should be given, as potassium citrate, 2 gm., in wintergreen water, 10 c.c., three times a day, after the main nourishments.

As stated above, the more at rest the patient is (in other words, the more he lies down) the better. There is less abdominal congestion, and the circulation in the congested region is improved. As an aid to resorption of the exudate in these swollen parts, abdominal warmth is advisable, and an electric heating pad or hot water bottle kept on the abdomen for hours at a time is good treatment. When the patient is up and about, the abdomen should be kept extra warm by flannel or absorbent cotton.

To relieve internal congestion and to increase the secretion of the skin and stop itching, it is advisable to have a daily hot bath. It is of advantage especially in removing the irritating crystals that occur on certain parts of the body from the perspiration in this condition.

As the patient improves, the diet can be enlarged with oranges, baked potatoes, rice and more meat, still withholding the fats, except that foods with cooked milk, as custards, may be well digested.

If the jaundice lasts more than ten days or two weeks, ammonium chlorid in half-gram doses, three times a day, after meals, may be given. Ammonium chlorid apparently increases the secretion of the mucous membranes. Probably it increases the secretion of the bile ducts as it does that of the bronchial

tubes. It may be a valuable treatment in this condition, when the improvement is slow. The following prescription may be utilized:

	Gm. or C.c.
R Ammonium chlorid.....	10
Syrup of citric acid.....	25
Water .....	up to 100

Mix and label: A teaspoonful, in water, three times a day, after meals.

### INTESTINAL STASIS—CONSTIPATION

The term intestinal stasis has of late years been used to include what was formerly classed as constipation, but with an extension to more serious cases which require surgical treatment. Intestinal stasis includes all cases in which the contents of the bowel fail to move in a normal manner, whether the cause be a mechanical obstruction or a functional failure due to the character of the intestinal contents or to the functional inactivity of intestinal musculature. The stasis may occur at various locations in the gastrointestinal canal, but the usual location in the cases under consideration are stasis in the lower part of the ileum, stasis in various sections of the large intestine and stasis in the rectum. Hindrance to the evacuation of the feces may be due to a paresis of the rectum or sigmoid, brought on either by repeated distention with feces or by the use of daily large rectal enemas. In these cases help may be obtained by daily diminution of the bulk of water used. A very frequent cause of constipation is insufficiency of feces resulting from the general insufficiency of the food taken or from the fact that it contains too little of the indigestible vegetable matter which favors the evacuation of the bowels. In such cases the feces are hard and dry, from the fact that during their stay in the large intestine the water has been absorbed to an undue extent. This form of constipation must be treated by proper diet.

### DIET

The constipated person should aim to add to his diet a larger quantity than normal of fluids, either in the form of water or perhaps of buttermilk. Tea

should be avoided because it contains tannin which may, by its astringent action, counteract the good effect of the larger quantity of liquid. Liquids should be given not only at meal times but in the intervals, in which case they serve better to replace the water absorbed from the large intestine. The diet for constipation should also contain as large an amount of fat as the patient can tolerate. The amount of vegetables which contain considerable quantities of cellulose should also be increased. This means plenty of vegetables. It is possible, however, easily to carry to extremes the eating of indigestible substitutes which add bulk to the diet. The accumulation of such masses in the bowel, even though evacuation is easy, does not have a favorable effect. Fruits should be given freely, except the astringent fruits. The amount of water taken depends on the patient's habits and the condition of the circulation. A patient who is muscularly active should drink more water than the one whose life is sedentary. A glass of cold water drunk in the morning while dressing is a great help to a physiologic movement of the bowels directly after breakfast.

#### LAXATIVE FOODS

The vegetables that are especially useful in chronic constipation are spinach, peas, cauliflower, cabbage, asparagus, salads, onions, celery and tomatoes. The cereals of importance are oatmeal and cornmeal, as well as graham, rye, whole wheat and bran breads. The following are also classed as laxative foods: Honey, cider, molasses, apples, pears, peaches, oranges, prunes, dates and figs. Buttermilk is preferable to sweet milk.

#### HABIT

The importance of establishing regularity of bowel action cannot be overstated. In a comprehensive study of the whole subject Thaysen concludes that this factor is of greatest importance. He gives his patients a printed card of directions as to diet and habit so that a regular time may be established.

The patient should go to stool every morning at the same hour whether the desire is present or not, and should attend to the matter at hand, and, especially

should not read for diversion. It is especially valuable to use a seat that is not too comfortable and to be able to flex the knees well up toward the abdomen; if the seat is too high a footstool may be used.

Abdominal massage, calisthenics, regulated exercise, walking, rowing, riding, golf playing, or any other muscular exercise that seems advisable should be ordered for the patient of sedentary habits, and it must be urged on him that if the habit of constipation is not now cured the future promises intestinal indigestion, dyspepsia, imperfect action of the liver, imperfect bile, nervous irritations, kidney irritations, and early cardio-vascular-renal disease; i. e., arteriosclerosis, weakening of the heart, and chronic interstitial nephritis.

#### MASSAGE

Before any severe exercise or any abdominal massage is ordered, or advised, a careful abdominal examination should be made and the physician assured that there are no inflammatory conditions present, as chronic appendicitis, gallbladder, pelvic or other disturbances.

Manual massage may be applied to the abdomen from fifteen to twenty minutes, beginning with light, circular stroking of the abdomen about the umbilicus, first having lubricated well the parts with olive oil. The course of the colon is gradually massaged deeply, all fecal masses broken up and moved down toward the rectum. When massage is deemed inadvisable or inconvenient, faradic electricity may be used. A large electrode may be over the lumbar or sacral spine and the other is moved over the abdomen, stroking from right to left. The duration of the treatment and strength of current should vary with the result on the patient. A vibrator may also be used gently over the abdomen.

#### MEDICINAL TREATMENT

Probably one of the best medicinal treatments of constipation consists in the administration of the fluidextract of cascara sagrada or some form of aloes or aloin. Sometimes podophyllin may be used



separately or combined with other laxatives. There are no other laxatives or cathartics so likely to benefit constipation as these drugs. Whichever one of these is used, it should be given, week by week, in gradually diminishing doses. Whether they should be given in small doses three times a day, or larger doses once a day depends on the conditions. Generally, the patient, not being sick and not willing to be bothered, and with the intent of having a stool after breakfast, and the medicine requiring a certain length of time to act, directly after supper or at bedtime, in one dose, is the best treatment. However, even with the best possible care, when these drugs are given, some patients require a dose daily for months and even years, and can not obtain a stool without it. This is generally not due to the action of the pill on the mind, as the substitution of an inactive tablet will prove.

Perhaps the next best laxative is phenolphthalein. This drug generally acts well and, if given in tablet, should be crushed with the teeth before swallowing, as it apparently acts better when well granulated. It should not be used too long as it may cause colon and rectal irritation.

In the simple constipation that is now being discussed it is inadvisable to resort regularly to enemas of any kind or to more brisk cathartics than those above mentioned or to saline cathartics.

Of late liquid petrolatum has achieved great vogue, as it acts merely as a lubricant, is inert, easy to take and supposedly does not form a habit. In large doses it may cause unpleasant rectal oozing.

A good general discussion of the whole subject appears in Fantus' "Useful Cathartics," published by the American Medical Association. To those especially interested a perusal of this book is recommended.

### SPASTIC CONSTIPATION

This form, which is usually reckoned as a distinct variety, is characterized by the distress experienced during the act of defecation and by the appearance of the stools, which are narrow, sometimes of the caliber of a lead pencil, and often covered with mucus.

Sometimes separate masses of mucus in the form of strings or membranes are passed with the stool or at times when no stool is passed. This spastic form usually occurs in neurotic patients and the whole clinical picture is dominated by the nervous element. These cases should receive treatment appropriate to their nervous condition and they are also benefited locally by oil enemas, given as a rule on alternate evenings. The technic of administering the oil is very simple. About 250 cubic centimeters of cottonseed oil, as warm as can well be borne, are injected through a funnel attached to a colon tube and allowed to remain in the rectum until the next morning. Patients unaccustomed to these injections should put on a large diaper after the enema to obviate the danger of the oil leaking through the anus. It is necessary to recognize a constipation of psychic origin and one due to habit, which must be treated by suggestion and education with appropriate hygienic aids.

What has been said above refers to the treatment of a symptom and only in the mildest cases is it curative in the sense of being addressed to the underlying lesion. Even in cases of spastic constipation which have been interpreted as pure neuroses it is probable that an anatomic basis is present in the form of a colonic catarrh which is greatly aggravated by the nervous condition. Following Lane, a large number of surgeons have explained the symptoms in a large category of abdominal and constitutional disorders as due to a mechanical hindrance to the passage of the intestinal contents and the consequent putrefaction occurring in the bowel.

Ptosis of the various parts of the intestine are believed to form the basis of the obstruction from which the abnormal symptoms arise. In other cases it is supposed that adhesions, inflammatory membranes, etc., cause bends and kinks in the intestine which prevent the free movement of the intestinal contents. Unanimity in the interpretation of these facts has not been reached by clinicians. A number, including Einhorn, Bastedo, Wilcox and others, consider that the bands and ptoses do not account for the stasis inasmuch as the symptom of stasis is frequently intermit-

tent and persons with equal mechanical hindrances may be free from symptoms indicating the occurrence of putrefaction.

Einhorn refers the doctrine of ptosis to Glénard. The theory of putrefaction and its resultant auto-intoxication is due to the teaching of Bouchard, Combe and others. This theory is made by Lane and his disciples the foundation for their plan of treatment. The digestive canal is called "a drainage tube" and compared to a sewer system in which any clogging must cause disaster. It has been asked if our body is resourceful in adequately fighting enemies that it has never before encountered—pneumonia, typhoid fever, etc.—how much more must we expect from it in the way of every-day defenses. It is surely well fitted to debar the entrance of harmful digestive products through the intestinal wall, for this is a continuous happening.

Unless there is a real mechanical obstruction or a definite organic lesion interfering with the intestinal current, a temporary delay of the contents may not be significant. It may even serve to make absorption more complete.

The usual simple habitual constipation does not cause auto-intoxication. As is well known, a patient may have no bowel movement for several days and still present no abnormal symptoms. The symptoms frequently associated with chronic constipation may be ascribed to nervous disturbances, and not to auto-intoxication. Reassurance and nerve sedatives in such cases will often do more good than drastic measures.

In mild cases Lane, following Glénard, recommends an appropriate abdominal supporting bandage. In the severer type Lane recommends operative measures—ileocolostomy or colectomy. With this radical plan of treatment most clinicians and some eminent surgeons do not agree.

#### SYMPTOMATOLOGY

The symptoms of the milder forms of intestinal stasis are the same as those commonly attributed to constipation. Much of such symptomatology may result from the effect of ptosis on a neurotic constitution and it is probably erroneous to attribute all symp-

toms observed in such patients to intoxication from the intestines. A proper estimate of the effects of the various factors influencing the clinical course of such cases is important, as indicating the relative importance to be assigned to different measures employed. Other symptoms are mechanical from the pressure of the delayed fecal masses, still others may result from dragging on the adhesions or bands connecting different organs; still others are due to nervous reflexes from irritation or inflammation of the mucous membrane of the colon. Lastly there are symptoms of actual organic lesions which may result from putrefactive changes in the contents of the colon. Such symptoms in severe cases may form a serious clinical picture.

#### DIAGNOSIS

It is fortunate that we possess means of making an accurate diagnosis of intestinal stasis by means of roentgen-ray examinations, either radiographs or fluoroscopic examinations. In this way the length of time that is required for food to pass through the different sections of the intestine can be determined, and it may be learned at what point the delay, if any, occurs. Abnormalities in the contour and position of the different parts of the intestine can also be determined in the same way. The existence of intestinal putrefaction is shown with certainty by the appearance of indican in the urine. The extent of the putrefactive changes are not, however, easily estimated in this way. If, on shaking out the urine with chloroform after treating it with Obermeyer's reagent (a solution of ferric chlorid in strong hydrochloric acid, two parts to one thousand) the chloroform has a deep blue color, a considerable amount of indican is present, and it is justifiable to assume that there is a considerable degree of intestinal putrefaction.

#### TREATMENT

The treatment of mild degrees of intestinal stasis is the treatment of constipation as previously outlined. To this should be added such mechanical supports as are necessary to obviate the effects of ptosis of the



intestine. As a laxative agent Lane has strongly recommended liquid petrolatum. Bastedo and more recent literature generally object to the use of the ordinary drug laxatives and recommend the use of agar-agar or of liquid petrolatum.

*Surgical Treatment.*—The question of what surgical measures should be resorted to and the proper time to apply them is very important. Medical treatment should be given a thorough trial. If medical measures fail, operation may be resorted to. Moynihan believes that nothing short of colectomy offers a substantial chance of cure. The part of the gut that needs removal is, he thinks, the last part of the ileum, the cecum and the ascending colon.

### HOOKWORM DISEASE

This disease is found in all tropical and southern temperate zones; in the United States southward from the Potomac River latitude through to the Pacific coast. The symptoms are laziness, lassitude, weakness, loss of physical and mental ability and vitality; loss of weight and anemia. Children do not properly grow and adults become shiftless, incompetent, and poverty stricken, and they, with their families, become a tax on the community. Hence hookworm eradication is an economic question.

The hookworm was discovered in Porto Rico by Major Ashford, Surgeon of the United States Army, but to Dr. C. W. Stiles of the United States Public Health Service belongs the honor of having found the worm in the southern states and of having shown that it differs generically from the Old World worm, but that it causes the same symptoms. The American type of worm is called *Necator Americanus*.

The disease can be discovered by giving the specific treatment in a suspected case and then sifting or washing the stools through cheese cloth, when worms will be found, if present. Billings and Hickey (*Jour. A. M. A.*, Dec. 23, 1916, p. 1208) describe an excellent simple technic for this purpose.

## TREATMENT

The treatment is to give little or no supper, and at bedtime a dose of magnesium sulphate. In the morning, as soon as the bowels have moved freely, one-half the dose of thymol, in capsules, is given, and in two hours the remainder of the thymol. Two hours later another dose of magnesium sulphate is administered. After movements of the bowels from this dose food may be taken, but only coffee or tea, without milk, should be allowed during the period of the treatment, namely, until the thymol has supposedly all passed out of the body. Absorption of thymol is not desired, as it may cause unpleasant symptoms. Alcohol and oils should not be given either before, during or even soon after the treatment. For one hour after taking the thymol the patient should lie on his right side to hasten the passage of the drug and liquid through the pylorus into the intestines.

The dose of thymol depends on the age, but is large. Ferrell suggests 4 gm. (60 grains) for an adult dose (that is, from 20 years of age upward). Doses for children and youth may be readily estimated by the following formula, namely: At 15 years,  $\frac{3}{4}$  of the age,  $\frac{3}{4}$  of the adult dose; at 10 years,  $\frac{1}{2}$  the age,  $\frac{1}{2}$  the dose; at 5 years,  $\frac{1}{4}$  the age,  $\frac{1}{4}$  the dose; at  $2\frac{1}{2}$  years,  $\frac{1}{8}$  of the age,  $\frac{1}{8}$  of the dose. If the patient is much underweight for his age, the dose should be reduced accordingly. The thymol should be powdered and placed dry in capsules. One-half the dose decided on is given at 6 a. m. If the bowels have been well moved from the dose of magnesium sulphate the night before, the other half of the dose of thymol should be given at 8 a. m., both doses being taken with plenty of water. Ferrell adds sugar of milk in equal parts to the thymol, and says he thinks the drug acts better.

In one or two weeks the treatment should be repeated, unless the microscope shows the feces to be free from the parasite and its eggs. Sometimes a third and even a fourth treatment may be needed. The action of the thymol may be hastened by (at the moment of swallowing) uncapping the capsules.

Thymol when absorbed acts like phenol, but it is slowly dissolved by the gastro-intestinal fluids and hence, is absorbed slowly. Any oil or fatty substance hastens its absorption. Convulsions are probably not often caused by thymol poisoning, but great weakness and finally collapse are the gross subjective symptoms. Objective symptoms of its undesired absorption are albumin and even blood in the urine. Fatty degeneration of the liver and congestion of the kidneys and lungs are pathologic findings.

To forestall any possible great absorption of thymol after large doses are administered in hookworm disease, a brisk cathartic (Epsom, Glauber's, or Rochelle salt) should be given and repeated, if free catharsis does not occur within a few hours after taking the thymol. Castor oil, or any other oil, should of course not be the cathartic used. If symptoms of poisoning occur, stomach-washing, colon-washing, and sodium sulphate or potassium and sodium tartrate should be the means used to promote elimination. Strong black coffee should be given, and hypodermic injections of atropin, strychnin, and pituitary extract should be administered and the patient should be surrounded by dry heat. Later, any kidney congestion should be treated as an acute nephritis.

Except as a specific for hookworm, thymol should probably never be used internally. As a bowel antiseptic it is too dangerous a drug to be used repeatedly, unless the dose is too small to be of any value.

Ferrell's dosage for adults for hookworm disease is as follows:

	Gm.	
R Thymolis .....	4	or gr. lx
Fac capsulas siccas 10.		

Sig.: Take 5 capsules, with plenty of water, in the early morning, as soon as the bowels have moved. Take the other 5 capsules in two hours. Two hours later take  $\frac{1}{2}$  ounce of Epsom salt, which should be repeated if it does not act in four hours.

#### USE OF CHENOPODIUM

The investigations of the United States Public Health Service have shown that oil of chenopodium (American wormseed oil) is also efficient in this

disease. (*Public Health Reports*, reprint No. 224, Oct. 2, 1914, by M. G. Motter.)

Wormseed oil seems to paralyze or stupefy rather than kill the hookworm; therefore it is very essential that soon after such action has occurred, a cathartic should be administered to cause evacuation of the worms before they can recover their vitality. Unlike male fern and thymol, castor oil may be administered with this drug. It will be remembered that any oil is likely to cause a dangerous amount of male fern and thymol to be absorbed. This is not true of wormseed oil.

The doses of oil of chenopodium suggested in this pamphlet are about 1 drop for every year of age up to fifteen. The drug is well administered in a teaspoonful of granulated sugar, every two hours, for three doses. Two hours later, a child of ten years, for instance, should receive a tablespoonful of castor oil with one-half a teaspoonful of spirits of chloroform. The dose of the castor oil and of the chloroform should vary according to the age of the patient.

The routine use of oil of chenopodium was found very satisfactory by Billings and Hickey and many others. The following method of administration was utilized for adults:

*Preparatory treatment:* At 7 a. m. magnesium sulphate, saturated solution, 60 c.c., is given. At 7 p. m., sodium sulphate, saturated solution, 90 c.c. The next morning chenopodium is commenced, proceeding as follows:

- 7 a. m., oil of chenopodium, 15 drops.
- 9 a. m., oil of chenopodium, 15 drops.
- 11 a. m., oil of chenopodium, 15 drops.
- 1 p. m., castor oil, 18 c.c.; chloroform, 2 c.c.
- 1:30 p. m., plain castor oil, 30 c.c.
- 2 p. m., a cup of hot tea.

The dosage of oil of chenopodium from 6 to 7 years is 5 drops; from 8 to 9 years, 7 drops; from 10 to 11 years, 10 drops; from 12 to 15 years, 12 drops; 16 years and over, and under 60 years, 15 drops.



A varying amount of the stock solution of chloroform-castor oil mixture is used, depending on the age of the patient, and sufficient castor oil added to make the total dose 20 c.c. In the second column of the above table is indicated approximately the amount of chloroform per dose in minims. The stock solution contains: chloroform, 2 c.c.; castor oil, 18 c.c.; one dose is 20 c.c. This dosage is to be used in conformity with apparent age only.

On the sixth day after treatment the stool is examined and, if found positive, another course of treatment is given and the stool again examined at the end of the second six days. It is not necessary to place limitations on the diet as is the case in using thymol.

#### DOSAGE OF THE CHLOROFORM-CASTOR OIL MIXTURE

Age	Dosage c.c.	Chloroform, Minims	Castor Oil, c.c.
From 6 to 7 years.....	6	11	14
From 8 to 9 years.....	8	12	12
From 10 to 11 years.....	12	15	8
From 12 to 13 years.....	14	20	6
From 14 to 15 years.....	16	25	4
Over 15 and under 60....	20	30	..

Kantor suggested the giving of oil of chenopodium by use of the intestinal tube. The tube is swallowed and the dose of chenopodium administered directly into the intestine. The oil of chenopodium is followed later by a large dose of warm solution of magnesium sulphate. This treatment assures that the oil reaches the point of lodgment of the worms directly.

Possible undesired symptoms from wormseed oil are drowsiness and depression. Such symptoms occurring, rapid purging should be caused by a saline cathartic, and such stimulants as hot coffee or caffein should be given.

Roth has reported symptoms of deafness occurring in a number of patients following treatment with oil of chenopodium. This usually cleared up within a brief period of time, but in two cases persisted longer than one year. This fact should be borne in mind when oil of chenopodium is administered.

## TAPEWORM

Treatment to eradicate a tapeworm is based on several factors which, though simple, are fundamental. The treatment should be grounded on a knowledge of the worm, its pathology and method of existence.

The diagnosis of the presence of any of the tapeworms in the bowel must be finally settled by the finding of the organism in the stools. However, other phenomena such as indefinite pains, a sense of distention, ravenous hunger, etc., are not unusual.

Before administering the anthelmintic several days should be devoted to the preparation of the bowel. The patient should take only a light liquid diet and should gradually cleanse the bowel by the use of the following prescription:

	Gm. or C.c.	
R Magnesii sulphatis.....	60	℥ ii
Spiritus chloroformi.....	15	or fl℥ iii
Aquae .....q. s. ad	200	fl℥ vi

M. Sig.: A tablespoonful, in water, three times a day, an hour before meals.

An enema of soap and water may be given at night. This treatment removes solid fecal matter from the bowel as well as any adherent mucus coating which may be present. The night before the final treatment is to be administered the patient is given a final cleansing dose, perhaps two tablespoonfuls of the above mixture, and he then takes no food and but little liquids. The next morning after the bowels have moved male fern may be given as follows:

	Gm.	
R Oleoresinae aspidii.....	4	or 3 i
Fac capsulas, 8.		

Sig.: Four capsules, with half a glass of hot water at 9 a. m., and four capsules, with hot water, at 10 a. m. [Important: Before taking the above capsules each one should be uncapped.]

At 12 o'clock three tablespoonfuls of the magnesium sulphate mixture should be taken, to insure the rapid passage of the male fern through the intestine lest too much absorption take place.

During the morning no nutrition should be taken other than black coffee, clear tea, or bouillon.

Except when momentarily otherwise engaged, the patient should be in bed, and should stay in bed the remainder of the day. For unavoidable faintness coffee may be administered at any time, or a hypodermatic injection of strychnin may be given. After 1 o'clock any food may be given the patient that he desires.

During the three or four hours of this active treatment, viz., from 10 a.m. to 1. or 2 p.m., the physician should remain with the patient, or a thoroughly trained nurse should be in attendance.

The stools should all be passed into receptacles where they can be thoroughly strained afterward, in order that the parasite's head may be sought, and if the above treatment is carried out it will generally be found.

Pomegranate has been highly lauded by various physicians as an efficient anthelmintic in these cases. It is best given, after thoroughly cleansing the patient's bowel as has been described, in the form of a fresh infusion. Three ounces of the fresh bark are macerated in twelve ounces of water for a half day and the infusion then boiled down one half. This quantity is taken within an hour, in several doses, and followed within an hour or two by castor oil.

Pomegranate may cause dizziness and extreme nausea when given in this form. As alternative an alkaloid derived from the bark—pelleterin tannate—is sometimes used. The dose is from 3 to 6 grains, and should be given fasting, mixed with a little water. A glass of water should be taken a little after its administration and an hour afterward a cathartic.

Other vermifuges include turpentine, kousso, pumpkin seed and thymol.

#### ASCARIS LUMBRICOIDES: ROUND WORM

The round worm is a common parasite, often very difficult to diagnose. The symptoms are indefinite and include vague colicky pains, foul breath, itching at the nose, etc. The common source of infection is water or food. The finding of the worm in the feces is the final proof of its existence. It is of reddish

brown color, about  $\frac{1}{4}$ -inch in diameter. The male varies in length from 4 to 8 inches, the female from 6 to 12 inches. Though the intestinal tract is the normal habitat the worms wander, and they have been found in the larynx, nose, Eustachian tube, tonsil and other contiguous structures.

#### TREATMENT

The diagnosis having been confirmed, treatment should be begun by administering laxatives at night to cleanse the bowel. Santonin is a favorite vermifuge in these cases, but many cases of poisoning have followed its use and it should be given with caution. The dose is 1 to 2 grains. The drug may be administered in the following form:

	Gm. or C.c.	
R Santonini .....	0 30	gr. v
Hydrargyri chloridi mitis....	0 20	or gr. iii
Sacchari lactis.....	3	gr. xlv
M. et fac chartulas 10.		

Sig.: A powder, in water, every hour for three doses.

Thymol has been used with good results in these cases and wormseed oil (*oleum chenopodii*), an American product, has given good results. The dosage of the latter may be five drops on a lump of sugar and this may be repeated and followed by a cathartic.

#### OXYURIS VERMICULARIS: PIN WORMS

This worm varies in length from  $\frac{1}{5}$ -inch for the male to  $\frac{2}{5}$ -inch for the female. The former has a blunt tail, curved upward, the female a pointed drawn-out tail. The most common symptom is itching about the anus, caused by boring movements of the female in depositing eggs in the rectum. The worm's chief habitat is the bowel from the jejunum to the anus. It is believed that the source of infection is the swallowing of ripe eggs in drinking water or food. The treatment consists in removing the worms by frequent washing of the region infected. Internally salts, such as magnesium or sodium sulphate, may be given, or large doses of calomel.



To dislodge the worms from the rectum enemata should be given. Among various enemata which have been recommended are decoctions of quassia—an ounce of quassia chips in a pint and a half of water boiled down to a pint and strained; lime water; salt water; glycerin and water; turpentine—1 dram to a pint of soap and water, etc.

For local itching and abrasion such ointments as the official unguentum phenolis (3 per cent.) or some mild sulphur ointment may be employed.

# DISEASES OF THE KIDNEY

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## PYELITIS

The causes of infection in the kidney, as elsewhere in the body, may be stated as a lowered resistance of the tissue and an organism capable of infecting the kidney, coming usually from a focus elsewhere in the body. Barber and Draper have shown that ascending infection by the ureters seldom if ever occurs as long as the peristalsis of the ureters is unimpaired and the ureterovesical valves maintain their integrity. Most infections are therefore probably hematogenous. The large number of such infections occurring in girls is evidence, however, that the condition is quite frequently a direct, ascending infection. Among the factors lowering the resistance of the kidney tissue, kidney stone is perhaps the most common cause, others being traumatism, urinary obstruction, displacement, etc. The pyelitis of pregnancy arises from pressure of the gravid uterus which may mechanically obstruct the ureters. Not infrequently the pyelitis is a complication of such acute infectious fevers as typhoid and pneumonia. Among the various focal infections which may bear an etiologic relationship to pyelitis are tonsillitis, alveolar abscesses, and infections of the accessory nasal sinuses, but cholecystitis and intestinal infection are very frequent causes.

The organisms producing pyelitis are colon bacilli, tubercle bacilli, staphylococci, streptococci, gonococci, typhoid bacilli, paratyphoid bacilli and pneumococci. These infections occur rapidly, are usually acute and persistent, may cause multiple abscesses, and may destroy the kidney and often the life of the patient. The early diagnosis must be made by exclusion, as the symptoms are essentially abdominal and may simulate other troubles like appendicitis, liver disorder, etc. The most prominent symptom in kidney suppuration besides fever is marked tenderness at the costovertebral angle, which is always present. The urine does not

always show the micro-organism but in advanced or serious cases it will contain leukocytes as shown by a milky appearance; and there will be a leukocytosis, usually not over 25,000. Polyuria, especially at night, is a fairly common symptom in children. A severe chill usually means a high grade of infection. Staphylococci and streptococci nephritic attacks are most frequent and have been observed following boils, tonsillitis, acute osteomyelitis, felon, ulcerations about the rectum and contagious impetigo.

### TREATMENT

Primarily in the treatment of pyelitis the cause must be sought, that is, the focus, the nephrolithiasis, or cystitis, and this condition treated primarily. The patient should be kept absolutely at rest in bed on a soft, meat-free diet. The liquid intake should be sufficient to cause the patient to pass from two to three quarts of urine daily and thus flush the kidneys out thoroughly. The bowels should be kept moving freely and regularly. The medicinal treatment of pyelitis depends on whether the urine is acid or alkaline. If the patient is troubled by frequency of and distress on urination it is best to render the urine alkaline as it is then less irritating. The alkalization of the urine is furthermore an excellent method of treating the pyelitis, for the bacteria causing the pyelitis do not thrive in an alkaline medium. The alkalization of the urine may be accomplished by the use of alkaline drinking waters, or fruit juices, of acetates, citrates or carbonates. The carbonates are the most effective, but are not always well tolerated by the stomach, in which case some of the other salts may be tried. It is best to use this method of treatment until the bladder irritability has disappeared and then allow the urine to become acid and to prescribe hexamethylenamin for a few days until the bladder becomes irritable again, when the alkaline treatment is resumed. Potassium citrate and sodium citrate are the preparations most commonly used. Smith (*Amer. Jour. Med. Sc.* 1, 392, 1918) recommends 15 to 20 grains every two hours during the day and perhaps every four hours during the night,

as may be required, to keep the urine alkaline for from ten days to two weeks after the symptoms have disappeared. Other drugs, such as salol, methylene blue and the oil of sandalwood also are used in the treatment of this condition.

Relief is frequently afforded to patients with pyelitis by ureteral catheterization and pelvic lavage with weak solutions of silver nitrate (1 per cent.), mercuric oxycyanid from 1:10,000 to 1:5,000, or formaldehyd (1:20,000). Argyrol, collargol and other silver preparations have also been mentioned for this purpose. It should be remembered, however, that ureteral catheterization requires expert technic.

In children, in whom the disorder is common, the majority of cases will yield to alkaline treatment and sweat baths. Vaccines are rarely useful in pyelitis. Autogenous vaccines may be tried, but they must be used with great caution, as violent reactions may be produced.

If a purulent kidney does not improve rapidly, if the patient is becoming debilitated, or if the kidney is found enlarged and examination of the urine from this kidney shows that the kidney structure is diseased, temporizing should cease, and the kidney should be removed, unless the other kidney is so diseased as to render the operative danger very great.

### RENAL TUBERCULOSIS

Renal tuberculosis is a progressive infection, slow in its development, often remittent and probably incurable by medical means. It may appear in the miliary form as a part of a general tuberculosis. There also exists a chronic parenchymatous nephritis occurring in the later stages of lung tuberculosis. According to some writers, there is an interstitial tuberculous nephritis. Most important, perhaps, is the type of minute focal infections tending to coalesce almost invariably unilateral at first and occurring in persons not affected with active tuberculosis. This is the form usually meant by the term renal tuberculosis. There are no diagnostic symptoms for the early stages. The first is vesical irritability, followed later by



albuminuria and perhaps hematuria. It is apt to be confused by the practitioner with renal stone, though that is a much rarer condition. Pyelography is an important aid to diagnosis. Pus in the urine is not long delayed and with it the tubercle bacillus appears. The blood stream is the mode of invasion except in very rare cases. One kidney is first affected in most cases, but the other kidney may later become involved. There is one way of treating the patient, namely, by nephrectomy, which gives immediate relief in 75 per cent. of cases, and permanent cures in perhaps 50 per cent., if the operation is early performed.

### ALBUMINURIA

The appearance of albumin in the urine may be due to any one or more of many different causes. These may be classed as follows:

1. A symptom of nephritis.
2. Accidental albuminuria:
  - (a) Dietary (alimentary).
  - (b) Chilling of the body.
  - (c) Unexplained (frequently focal infection).
3. Incidental albuminuria:
  - (a) Cold baths.
  - (b) Menstruation.
  - (c) Athletics or other physical strain.
  - (d) Cardiac weakness.
  - (e) Irritation in some part of the urinary tract.
  - (f) Hypertension.
  - (g) Ether or other anesthesia.
4. Orthostatic (lordotic, cyclic, adolescent).

Albumin in the urine comes either from the kidneys or from the urinary tract. If it is the result of a localized irritation, inflammation or hemorrhage, there are more leukocytes present in the urinary sediment than in ordinary albuminuria. In case of hemorrhage erythrocytes will be found. Albuminuria caused by nephritis will be discussed under that head. When albuminuria is caused by any of the conditions listed as accidental or incidental the prevention and treatment is self-evident. Athletes and others performing severe muscular exercise not infrequently give evidence

of a temporary albuminuria. Bornstein and Lippmann (*Ztschr. f. Klin. Med.*, 86, 345, 1918) noted a striking parallelism in such cases between the excretion of albumen and the acidity of the urine. The frequency of cylindroids in the urine also seemed to be related to the concentration of urinary acid. These phenomena—albuminuria and cylindroids—were checked by administration of alkali during the exercise or working period.

Orthostatic albuminuria is shown to be related to lordosis which produces a passive hyperemia of the kidneys with leakage of albumin. It should be limited to that albuminuria without casts which occurs after standing or moving about, and which disappears with a reclining position. It may also be due to an insufficiency of the kidney circulation, possibly congenital, with or without lordosis. It may also be due to certain occupations which throw an especially large amount of work on the kidneys, resulting in passive congestion. Before an albuminuria is considered a simple albumin leak, all suspicion of more serious conditions of the kidneys must be eliminated by examinations of the urine under varying conditions. Casts must be absent, and there must be no cardiac hypertrophy or other symptoms which would show that the kidneys are suffering from localized or general inflammation.

The results of a urine examination on first rising in the morning and again in the latter part of the afternoon will show whether the condition is an orthostatic albuminuria. Dietary tests and exercise tests will also show the limitations of the kidneys and their ability to sustain increased work.

#### TREATMENT

Strenuous exercise should be forbidden, and the body functions should be regulated in an effort to secure as near an approach to normal as possible. A great deal of rest should be enforced. Anemia should be looked for and treated. The condition of the heart should be studied and regulated. The bowels should be regulated and the intestinal condition kept normal

by the use of a carefully chosen diet. Sea bathing and cold bathing should be prohibited. A warm bath may be allowed regularly to aid elimination through the skin. Alkalis may be administered experimentally and their effect on the urine findings carefully noted.

### ACUTE NEPHRITIS

Acute nephritis arises as a result of injury to renal parenchyma due to bacterial infection or chemical toxins. To the first of these belong the acute nephritis of scarlet fever and the other acute infections, though there may be a toxic element in addition. The classical example of the infectious type of acute nephritis is that which follows an acute tonsillitis or sinusitis. As examples of the toxic type, we have the cases following extensive burns and poisoning with such substances as turpentine, cantharides, phenol, the salicylates, potassium chlorate, iodoform, mineral acids, arsenic, phosphorus, mercury and lead. The acute nephritis of pregnancy is also probably in part of toxic origin. Alcoholism is of itself probably not a cause of nephritis, but the exposure that so often accompanies excessive use of alcohol may give rise to an acute infection which is the cause of the nephritis. Bacteria are present in nearly all types.

As to prognosis, the acute nephritis may clear up entirely, it may become chronic, or it may end fatally due to uremia, anasarca, or to a pneumonia or other terminal infection. In some cases there results a permanent albuminuria which is not, however, accompanied by symptoms of renal disease. In fact, in these cases there is no impairment of renal function as shown by such functional tests as the phenolsulphonephthalein test. The cause of this albuminuria is probably a permanent cicatrization in a portion of one or both kidneys which is, however, not sufficient to impair the renal function.

There are two rather diametrically opposed methods of treating acute nephritis, one based wholly on clinical experience and the other principally on the experimental work of Martin H. Fischer.

## FISCHER TREATMENT

Fischer in his experimental work has shown that acidosis will cause edema and albuminuria and that this edema and albuminuria can be overcome by overcoming the acidosis with alkalies. He argues that in nephritis we have conditions similar to those that he has experimentally produced by acidosis and overcome by the use of alkalies. Further, he has shown that by using sodium chlorid, a smaller amount of alkali is needed to overcome the acidosis and the resulting edema. He has outlined a treatment for nephritis based on this experimental work which in many cases seems to produce better results than any other treatment. He recommends that this hypertonic solution (sodium chlorid 14 grams, sodium carbonate 10 grams and water 1,000 c.c.) be given per rectum; this is best given by the drop method and, unless the patient is becoming uremic, 500 c.c. at a time twice a day. If the patient is showing symptoms of impending uremia 1,000 c.c. may be given per rectum or even intravenously. In giving the solution intravenously care must be taken that none of the solution enters the tissues as the hypertonic solution may cause a slough. The best method of giving it intravenously is through a needle into one of the veins of the forearm, such as the median basilic vein; the solution should enter slowly, so that it may be well mixed with blood. Fischer's directions should be followed in preparing the solution for intravenous use. In addition to the above intravenous or rectal medication, he recommends giving alkalies and sodium chlorid by mouth. The alkalies may be given in water or in fruit juices. The liquid intake is not limited, but all liquids should be isotonic or hypertonic so as not to overcome the effect of the solution given per rectum. The diet is composed of soft foods which are heavily salted. The patient should be kept at rest in bed until well on the road to recovery and then allowed up a little more each day. The bowels should be kept moving freely by the use of salines. The total liquid intake and output must be accurately measured to make sure the edema is lessened.



## GENERAL TREATMENT

The following method of treatment is based on clinical experience and is in many ways opposed to Fischer's method.

The patient should be put to bed in a warm, well ventilated room. All irritant drugs should be avoided; cold applications should be avoided and also all chilling of the body. Baths should be taken in warm or hot water. Meat and meat proteins should be avoided as soon as albumin is found in the urine and the diet should be restricted to milk, thin gruels, barley water, etc. If possible the diet should be very free of salt. It is generally considered advisable because of the edema to restrict the water intake, but if the diet is salt free a moderate amount of water may be allowed. A refreshing drink may be prepared from a teaspoonful of cream of tartar in a pint of boiling water to which is added the juice of a lemon and a little sugar.

If the patient's stomach is disturbed, a short starvation period is advisable. Liberal quantities of hot water may be given to relieve the vomiting, and if this is not sufficient, several 1 gm. doses of bismuth subcarbonate and sodium bicarbonate should be given every three hours until relief ensues.

To promote elimination the body should be kept quite warm and hot sponge baths given. Warm applications may be applied to the kidney region. A few grains of calomel, or a saline purgative should be given to free the intestinal canal of toxic substances. In children rhubarb or cascara sagrada may be used. Enemas may be substituted for the cathartics. Diuretics should not be given with the exception of water, to which sodium citrate or orange or lemon juice may be added.

As has been stated the patient should be kept physically and mentally at rest. If he is restless and cannot sleep a dose or two of chloral or of a bromid may be given. It is well to avoid the synthetic drugs because of their irritant effect on the kidney.

Warm applications to the kidney region will aid in allaying the inflammation and to hasten the stage of resolution. These applications may be applied as hot alcohol and water fomentations bound close to the back

by a bandage around the abdomen, kept warm by a hot water bag and changed as soon as cool; by the old fashioned flaxseed poultice; by an electric heat pad, or by any other simple method.

Under good treatment the albumin and casts usually disappear in from five to six weeks. During convalescence the diet is gradually increased, a little salt being given from time to time. The patient may be given bread, rice, more cereals, potatoes, less milk and no meat. Small doses of iron (tincture of ferric chlorid, 5 drops three times a day) may be given in orangeade or lemonade. Saccharated ferric oxid, 3 to 5 grains, may be given in tablet form. Eggs, vegetables and fruit are gradually added to the diet and then after some weeks of a normal output of urine meats in small quantities may be tried.

The signs of uremia are eyeblurs, possibly retinal changes, severe headache, momentary losses of consciousness, twitching of the muscles, cramps and eventually convulsions and coma. The treatment of uremia will be discussed in a separate article.

Treatment of acute nephritis by nephrotomy or by renal decapsulation has been practiced by some, especially in those cases in which there is an abundance of lumbar pain and not very severe urinary symptoms. These operations have in some cases caused relief of symptoms, but should be tried as a last resort. The resulting scar tissue as it contracts may of itself aggravate conditions, especially if a chronic interstitial nephritis should ensue.

As many cases of acute nephritis are due to bacterial infections the question of the use of vaccines arises. Vaccines as yet have not proved to be of any assistance in the treatment of nephritis in the acute, subacute or chronic stages.

### CHRONIC NEPHRITIS

Chronic nephritis, Bright's disease, or as it is sometimes called, cardio-vascular-renal disease, is increasing in frequency in this country, therefore its prophylactic treatment is very important.

Patients suffering from this disease usually first consult a physician on account of the symptoms that are usually associated with high blood pressure. In

some of the cases there is a history of a previous acute nephritis, of acute inflammatory rheumatism, there may be an old heart lesion or some other point in the history that makes the solving of the problem relatively simple. In the majority of the cases, however, this history is not found and a physical examination reveals nothing but a slightly enlarged heart and a slight edema of the feet. Urinalysis may reveal nothing, but on repeated examinations the urine will be found to be of low specific gravity and occasionally to contain casts and a trace of albumin. The blood pressure will be found to range from 170 to 200. In these cases a careful search for a chronic focus of infection sometimes reveals trouble in the tonsils, teeth, sinuses, or gallbladder. All foci of infection should be removed, if possible.

#### SYMPTOMS

The general symptoms of chronic nephritis may include in addition to the characteristic changes in the urine, headache, indigestion, diarrhea or constipation, mental apathy or irritability, insomnia, dyspnea, edema, intermittent eye and ear disturbances, enlargement of the heart, high blood pressure, neuralgias, anemia, and retinal changes.

#### TREATMENT

The diet selected for chronic nephritics should be based on the excretory ability of the kidneys, the non-protein nitrogen content of the blood, the condition of the heart, the blood pressure, the state of the digestion, the weight of the patient and the physical and mental work required of him. The diet should be varied quite frequently. It is well for the patient to have nothing but skimmed milk one day in the week. It has not been shown that fresh fish, poultry and meat, except kidneys, sweetbreads, liver and shad roe (rich in purins), are any more harmful to the nephritic patient than are the vegetable proteins such as nuts, peas, beans and oatmeal, though some patients may tolerate these better.

In the cases in which there is an old organic heart trouble this must be treated primarily, and as the heart condition improves so does the kidney trouble.

The best treatment for these cases is rest in bed on restricted liquids and a soft, meat-free, salt-free diet. In the more severe cases the Karell management is efficacious. The Karell treatment consists of rest in bed and a light diet of milk and eggs. The fluid is limited to  $1\frac{1}{2}$  pints per day. At first this is given, for two or three days, as milk only, 6 to 7 ounces at 8 a. m., and 4 to 8 p. m. This is the most trying part of the method. Then 1 egg is given at 10 a. m., and a biscuit at 6 p. m. for two days. Then 2 eggs with bread, and a little minced meat are allowed. In twelve days the patient returns to a careful ordinary diet, the fluid being still kept down to  $1\frac{1}{2}$  pints, but not necessarily milk only. This method is said to be indicated for weak hearts for which digitalis is less appropriate. About the third day diuresis sets in for a short time, the dyspnea is relieved, the pulse improves and the edema subsides. Elimination through the gastro-intestinal tract should be promoted by the use of calomel (3 gr.) at night and salines in the morning. If the patient is showing signs of intoxication, and is strong enough, hot air sweats may be beneficial. Venesection may also be indicated in such cases and, by relieving the heart and removing toxins, often causes marked improvement. The same management is applicable to the cases in which the kidney is the most affected organ.

A most important item in the treatment of chronic nephritis is the preservation of cardiac compensation. The high blood pressure and cardiac hypertrophy of chronic nephritis constitute a compensatory mechanism enabling the kidneys to maintain adequate function. They consequently are essential to the preservation of life and should be protected by every hygienic and dietetic safeguard. High blood pressure should not be made the object of direct therapeutic attack. Nitrites should be reserved for emergency use to combat such developments as angina, cardiac asthma, etc. The appearance of dropsy in primary chronic nephritis almost invariably signifies the advent of cardiac failure. At this stage digitalis becomes the mainstay of treatment and should not be withheld because the



blood pressure is high, as it acts just as well, or even better, with a high blood pressure as with a falling pressure.

In the cases that are primarily cardiac the use of caffein, digitalis, strophanthus and the other cardiac tonics is of great value. The use of theobromin and other drugs, the action of which is essentially diuretic, should be guarded, as in many cases of chronic renal disease they do not increase the output of urine and act rather as a poison to the system.

In certain cases of chronic nephritis in which there is considerable edema without dilatation of the heart the Fischer treatment, as described under acute nephritis, produces excellent results, but on the whole it does not seem to be as efficacious in the chronic as in the acute nephritides.

For the control of the edema Epstein has outlined a diet to increase the protein content of the blood. Substances rich in protein are selected and a total of 120 to 240 gm. of protein supplied daily. This, it is argued, helps the blood to regain its osmotic power.

#### ARTERIOSCLEROTIC TYPE

Another form of chronic nephritis that must be considered is that caused by general arteriosclerosis. In this form there are two causes for the trouble, namely, the injury to the kidney parenchyma from the altered blood supply to the kidneys and the toxemia arising from the altered metabolism throughout the body which is due to impairment of the circulation from the arteriosclerosis. In this form the treatment must necessarily be purely palliative, as the cause can not be removed. These cases are usually weak, anemic and poorly nourished and consequently the sweats and venesection cannot be used. The Karell management is the best to use in severe cases of this type, but ordinarily restriction of liquids to one quart or so, a meat-free diet and free catharsis suffices to keep these patients comfortable. In these cases diuretics and cardiac stimulants must be used with great care and in many of them are contraindicated.

In those cases of nephritis in which there is amyloidosis the treatment should aim primarily at the causative condition, as the kidney condition is secondary to it.

#### CARDIOVASCULAR RENAL DISEASE WITH HIGH BLOOD PRESSURE

As to the treatment of the cases of long standing cardio-vascular-renal disease that are to all appearances in excellent health, but have a constant high blood-pressure and much of the time have albumin or casts in the urine: Most of these cases may be kept very comfortable and the blood-pressure kept reasonably low if they will diet carefully and exercise only moderately. Such individuals should eat but little meat of any kind. Coffee, tea, alcohol, rich spiced foods and tobacco should not be used at all. The diet then should consist of fruits, cereals, vegetables, eggs, milk, cream, butter, and in most cases a little meat once a day. Shell fish may be used in moderation.

These patients may exercise moderately, and indeed it is best for them to get a definite amount of out-of-door exercise. Walking is the best form and for some golf in moderation. Whatever form of exercise is taken, it should be begun gradually and increased slowly. While this is being done the patient should be frequently examined by the physician to make sure that he is not overdoing.

#### MASSAGE AND BATHS

The massage and bath treatment of nephritis, when regulated by a physician who is in close touch with the patient's general condition, given at many places abroad and in this country, is excellent. However, unless controlled by a physician, such treatment may do a great deal of harm. Massage is only a form of exercise and if overdone may do as much harm as too much exercise of any other sort. Baths are quite enervating and fatiguing even to a healthy individual who is not accustomed to them, and so to the nephritic with his lowered vitality they may be a source of great danger.

## CLIMATE

When it is possible, patients suffering from chronic nephritis should spend as much time as possible in warm climates, as warm weather promotes elimination through the skin. Furthermore, by causing a superficial vasoconstriction, cold tends to increase the tension in the deeper vessels and so increase the possibility of cerebral hemorrhage or hemorrhage from other vessels. Angina pectoris, which may be a complicating factor in many of these cases of hyperarterial tension, often follows sudden exposure to cold.

## UREMIA

When uremia is imminent premonitory symptoms occur, such as headache, fulness of the head, vertigo and blurring of vision, muscle twitching, muscle cramps, restlessness, insomnia or drowsiness and frequently nausea, vomiting and diarrhea. The blood pressure increases and the urine shows a decrease in the amount of solids excreted. Chilling, a high protein meal, extra muscular exercise, nervous or mental excitation, or anything which may suddenly increase metabolism and nitrogen waste may precipitate an attack.

## TREATMENT

The diet in impending uremia should be the minimum diet, perhaps only as much as a pint of milk a day. The water intake should depend on the amount of water elimination, edema and dropsy. As the diet is increased considerable alkali and cereals may be given, to combat acidosis.

In uremic patients there is a severe toxemia due to renal insufficiency. When the patient is quiet, the relief of the toxemia is the chief requirement except such supportive measures as may prove necessary. This toxemia has usually been treated by the promotion of elimination through the skin by sweats, through the intestines by free catharsis and rarely by venesection. The diuretics are generally of little use in treating these conditions. Fischer's solution administered intravenously or per rectum has proved to be one of the best methods of promoting elimination

through the kidneys in these cases; the general symptoms are also greatly relieved, even when sweating and venesection are not used. Some of the most striking results obtained by the use of Fischer's solution have been in cases in which there was insufficient excretion of urine and a consequent uremic condition with no clinically demonstrable anasarca.

#### RESTLESSNESS

In those cases of uremia in which the patient is extremely restless, and also in those in which there are convulsions, the eliminative treatment must be used, and in addition the patient must be quieted. In the first place the usual methods of restraining a patient in bed must be practiced; windows should be protected to prevent accidents; all instruments with which injury might be done to attendants or to the patient should be kept out of reach. Bromids may be given in enemas in doses of twenty to thirty grains in place of the salt of the Fischer's solution. If the patient will take them, they may be given by mouth. Chloral may also be administered either by mouth or per rectum. In the more severe cases it is necessary to use opiates and sometimes even chloroform to quiet the convulsions.

#### VENESECTION

If the blood pressure is very high, and apoplexy or sudden dilatation of the heart threatens, venesection should be done, as also in threatening convulsions or coma.

#### CYSTINURIA

Cystinuria may be classed among the rarities of medical practice. However, the perversion of metabolism whereby cystin, one of the amino-acid fragments of the protein molecule, is not destroyed in the body as it is in a normal person, is not so uncommon as statistics might lead one to believe. As the metabolic disorder may exist for very long periods without revealing itself by any easily detected symptom other than the presence of the unutilized cystin in the urine, the discovery of the cases becomes more or



less fortuitous. Only when urinary concretions arise to direct attention to their cause, or when the presence of cystin is detected by chance in a routine examination of the urine, does the anomaly come to the knowledge of those who are interested in its cause and treatment.

From the point of view of the patient the chief problem in connection with cystinuria is either to decrease the output of cystin or to increase its solubility in the urine—or both—with the aim of avoiding the impending danger of calculi. The pronounced insolubility of cystin in urine of the usual reaction makes the possibility of attacks of “kidney colic” and related consequences an ever-present one. It has long been known that the output of cystin can be decreased by a diminution of the metabolism of its mother-substance, protein. In the entire absence of any intake of albuminous foods the urinary excretion of cystin is reduced to an endogenous level, represented in an illustrative case in literature by 78 mg. a day.

Klemperer and Jacoby (*Therap. der Gegenw.*, 1914, lv., p. 101) studied the results of alkali administration in such a case. They found that the deposited cystin sediment promptly decreased in amount and soon completely disappeared from the urine following the daily ingestion of from 6 to 10 gm. of sodium bicarbonate. From the point of view of preventing the precipitation of cystin and consequent formation of calculi, this treatment was evidently successful. Incidentally, it further developed that even dissolved cystin entirely disappeared from the urine as the result of the alkali therapy.

### INDICANURIA

Indicanuria is of comparatively frequent occurrence and is generally understood to mean that some protein putrefactive process is taking place in the ileum and colon with the production and absorption of indol and the excretion of indoxyl potassium sulphate (indican). Indican in the blood is not poisonous, but other products of decomposition and toxins absorbed from the intestines at the same time as the indol may produce symptoms of intoxication. Indol, skatol and

cresol with toxalbumin will frequently produce symptoms of poisoning such as headache, restlessness, insomnia, gastro-intestinal indigestion, dryness of the skin or sometimes a profuse perspiration, eruptions, and even a rather severe kidney irritation.

#### TREATMENT

If it is found that the amount of indican excreted is increased the diet should be modified. Animal proteins should be removed for a time and there should be thorough purging. The cause of the condition should be sought. The bowels should be caused to move daily and regularly; colon washings may be given until the urine is practically indican free. Yeast or lactic acid bacilli may be administered, but it is doubtful that they exercise any very prolonged effect. Liquid petrolatum is now much used but it is a question whether it may not interfere with the secretions if given over long periods. Phenyl salicylate (salol) in a dose of 0.25 or 0.30 gm. in capsules, three times a day after meals, for a short period is often of benefit in preventing intestinal fermentation. Anemia is not rare accompanying chronic intestinal putrefaction. The weight of the patient should be noted carefully and the skin watched for the appearance of eruptions, dryness or profuse perspiration in order to regulate properly the food, drink and possible drug administration which may be required.

# DISEASES OF METABOLISM

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## DIABETES MELLITUS

### DEFINITION

Diabetes has been defined as a "specific deficiency of the power of assimilating food." The generally accepted view, based on experimental evidence, refers the deficiency to a diminished functional capacity of the pancreatic islets. A person with a normally functioning pancreas may ingest a quantity of food considerably in excess of his energy requirement and completely assimilate all that is digested and absorbed, even though the greater part of the food may be carbohydrate. An average adult, performing light work, will ingest and metabolize from 300 to 500 gm. of carbohydrate a day. With impaired pancreatic function, the organism becomes incapable of assimilating even such quantities of carbohydrate as are contained in a general mixed diet, that is to say, a diet sufficient to cover the energy requirement in which from one half to two thirds of the total caloric intake is in the form of carbohydrate.

Where there is a deficiency of the power to assimilate carbohydrates, glucose accumulates in the blood; and when the concentration reaches a certain limit, the excess of glucose overflows through the kidneys. Thus, *glycosuria constantly occurring in an individual whose food intake is within the limits mentioned above, is evidence of diminished pancreatic function of the specific type here considered—it is evidence of diabetes.*

Strictly speaking, this statement requires some modification, for there are certain persons who pass sugar in the urine when the blood sugar concentration is normal or even below normal. The glycosuria in such cases seems to be due to an increased permeability of the kidney for glucose. This condition of "renal diabetes" is of infrequent occurrence; it is unaccompanied by the characteristic symptoms of dia-

betes, such as polyuria, and polydipsia; the amounts of sugar excreted in the urine are seldom large, and bear but little relation to the carbohydrate intake. A positive diagnosis of the condition can be made only by demonstrating a normal or low blood sugar count coincident with glycosuria.

If the food intake of a diabetic is diminished so as to come within his assimilative capacity, sugar excretion ceases. Absence of glycosuria is, therefore, not to be taken as evidence that diabetes is not present, unless the individual is on a full, mixed diet.

For the detection of glucose in the urine a very satisfactory reagent is Benedict's (*Jour Biol. Chem.*, 1909, v. 485), modification of Fehling's solution, since it is very sensitive to glucose, but, unlike the original Fehling's solution, does not react with a number of normal and accidental urinary constituents. The reduction test, if slight, should be confirmed by the fermentation test.

In diabetes, there is a lowered functional capacity, not only for the assimilation of carbohydrate, but also for protein, since the latter food may yield a considerable amount of its starch.

In diabetes the metabolism of fats is affected since, as Naunyn has expressed it, "fats burn in the fire of carbohydrates." With failure to assimilate carbohydrates the "fire" may be but a smoldering one, so that fats are incompletely burned with the formation of acetone, aceto-acetic acid, and beta-oxybutyric acid. The latter two substances, being acids, may, if produced in sufficient amounts, lead to a serious disturbance of the acid base equilibrium of the body, known as *acidosis*. It is acidosis that is presumably the cause of diabetic coma.

#### OBJECT OF TREATMENT

The object of the treatment of diabetes is to supply a diet that can be metabolized and that will not overtax the weakened carbohydrate metabolism. Allen has aptly compared the functionally weak pancreas to a "weak" stomach. If the latter, with frequent rests, is



supplied with food of such quality and such quantity as can be readily digested, it may functionate satisfactorily, and may even be able to digest larger and larger amounts of food, although it will never become a "strong" stomach. Continued dietary insults, on the other hand, would further weaken the organ. The same holds true for the functionally weakened pancreas; it may be able to provide for the assimilation of a certain amount of food, but if overwhelmed with an amount in excess of its capacity, a progressive diminution in capacity results. A weak stomach if overtaxed usually gives warning by discomfort; an overtaxed pancreas gives no such warning.

#### THE ALLEN TREATMENT

The diabetic who constantly indulges in food in excess of his assimilative capacity invariably becomes progressively worse; hence the conception has arisen that diabetes is characterized by an inherent downward tendency. As a matter of fact, practically every diabetic has some tolerance for food, and the tolerance is usually sufficient to allow for a great enough food intake to cover the basal energy requirements. With proper treatment, it is possible to maintain or even to increase this tolerance. This is the underlying principle of the modern treatment of diabetes as formulated by Dr. Frederick M. Allen. On the basis of animal experiments and carefully controlled clinical observations, he has proposed a system for the treatment of diabetes that incorporates those features of the older methods that are of proved value, but introduces, in addition, a number of features, some of which are in direct opposition to the older teachings.

This treatment may be briefly outlined as follows:

1. A preliminary fast is taken until the urine is free from sugar.
2. Following the fast, carbohydrate food is gradually added, at first in the form of green vegetables.
3. Coincident with the addition of carbohydrate, or in place of it if the carbohydrate tolerance is very low, protein is added to the diet in small but gradually

increasing amounts until glycosuria occurs, or a sufficient amount of protein is taken to cover the basal requirement.

4. Fats are added in small amounts during the time of addition of carbohydrates and protein. Subsequently, a sufficient amount of fat is added to make up the fuel requirements of the body, provided this amount can be tolerated without the appearance of glycosuria or acidosis.

5. Frequent urine examinations are made, either by the medical attendant or by the patient himself, and the appearance of glucose is taken as an indication for a fast of sufficient length to cause a cessation of the glycosuria. Feeding is subsequently begun with not more than one half of the carbohydrate contained in the diet at the time of the appearance of glycosuria. Subsequent carbohydrate increase is made very gradually.

6. At intervals, the patient is fasted for a day or else takes a greatly restricted diet.

7. Body fat is reduced to a minimum and the adult diabetic is not allowed to gain weight; children may gain, but the gain must not be adipose tissue.

8. Active daily exercise carried to the point of healthy fatigue is advocated.

#### THE PRELIMINARY FAST

The object of the preliminary fast is to remove from the body the excess of unassimilated carbohydrates and to allow for a rest of the overtaxed pancreatic function. As a result of the fast and, indeed, during the fasting period, a proportionately larger amount of carbohydrate may be metabolized. Paradoxical as this may appear at first sight, it has been definitely proved by calorimetric observations on severe diabetics. With the removal of the unassimilated excess, the organism is better able to assimilate an amount of carbohydrate which it was previously unable to utilize. Before the fast is begun there should be two or three days of privation of all fats.

During the fast, in the majority of instances, there is a decreased production of the potentially harmful

aceto-acetic and beta-oxybutyric acids. This, presumably, is the result of the relative increase in carbohydrate assimilation.

The length of fast required before the urine becomes sugar free is usually less than five days; exceptionally, it may be as long as eight or ten days. Water is allowed *ad libitum*, and tea or coffee in moderate amount if desired. No sugar or cream is allowed, though saccharin may be used for sweetening. A reasonable amount of clear meat broth may be taken after the second day of fasting.

Alcohol, in the form of whisky, has been recommended, since it does not increase glycosuria, and in certain cases seems to inhibit the production of the acetone bodies. The amount of whisky given may be 1 ounce three times daily. It may be given in black coffee. • Alcohol is *not an essential* in the treatment, and should not be administered to patients in whom it produces such symptoms as burning in the throat, headache and nausea.

#### DURATION OF FAST

The great majority of diabetics may be fasted until the urine is sugar free, without the development of any untoward symptoms or complications. Exceptionally marked prostration, nausea, increasing drowsiness and deep breathing (acyanotic hyperpnea) may occur. These are symptoms referable to acidosis, and occur coincidentally with alterations in the composition of the blood, alveolar air and urine. With the appearance of a severe and progressive acidosis, the fast must be terminated for the time being, and treatment directed against the acidosis. (This phase of the subject is discussed under the head of Acidosis.) After a period of restricted diet a subsequent fast usually results in a sugar-free urine without the development of acidosis.

#### THE DIET

*Addition of Carbohydrates to the Diet.*—When, as a result of the fast, the urine has been free from sugar

for twenty-four hours, feeding may be cautiously begun. All the food given must be weighed and its composition must be known approximately, at least. Unless this is done, no accurate idea of the food tolerance or of its caloric value can be obtained, and subsequent treatment becomes of necessity a "hit-or-miss" affair, with the probabilities all in favor of its being a "miss." Information as to the composition of the common foods may be obtained from various treatises on dietetics and food chemistry.

The accompanying table, compiled by Joslin, contains in a compact form all the essential information. The figures, although only approximate, are sufficiently accurate.

#### JOSLIN'S DIET TABLE

Strict Diet—Meats, Fish, Broths, Gelatin, Eggs, Butter, Olive Oil, Coffee, Tea and Cracked Cocoa

FOODS ARRANGED APPROXIMATELY ACCORDING TO PERCENTAGE OF CARBOHYDRATES

#### Vegetables

5 Per Cent.	10 Per Cent.	15 Per Cent.	20 Per Cent.
Lettuce	Onions	Green peas	Potatoes
Spinach	Squash	Artichokes	Shell beans
Cauliflower	Turnip	Parsnips	Baked beans
Sauerkraut	Carrots	Canned lima beans	Green corn
String beans, canned	Beets		Boiled rice
Celery	String beans		Boiled macaroni
Asparagus	Pumpkin		
Cucumbers	Kohlrabi		
Brussels sprouts	Green peas, canned		
Sorrel			
Endive			
Dandelions			
Swiss chard			
Sea kale			
Tomatoes			
Rhubarb			
Egg plant			
Leeks			
Beet greens			
Watercress			
Cabbage			
Radishes			
Pumpkin			
Kohlrabi			
Broccoli			
Vegetable marrow			
Artichokes, canned			
Mushrooms			
Okra			



## Fruits

Ripe olives (20 per cent. fat)	Lemons	Apples	Plums
Grapefruit	Oranges	Pears	Bananas
	Cranberries	Apricots	Prunes
	Strawberries	Blueberries	
	Blackberries	Cherries	
	Gooseberries	Currants	
	Peaches	Raspberries	
	Pineapple	Huckleberries	
	Watermelon		

## Nuts

Butternuts	Brazil nuts	Almonds	Peanuts
Pignolias	Black walnuts	Walnuts (Eng.)	
	Hickory	Beechnuts	40 Per Cent.
	Pecans	Pistachios	
	Filberts	Pinenuts	Chestnuts
5 Per Cent.		Reckon <i>actually available</i> carbohydrates in vegetables of 5 per cent. group as 3 per cent., of 10 per cent. group as 6 per cent.	
Miscellaneous. — Unsweetened and unspiced pickles, clams, oysters, scallops, liver, fish roe			

Thirty gm. or 1 ounce, of each of the following contain approximately:

	Protein, Gm.	Fat, Gm.	Carbo- hydrates, Gm.	Calo- ries
Oatmeal, dry weight.....	5	2	20	120
Meat (uncooked).....	6	3	0	50
Meat (cooked).....	8	5	0	75
Broth.....	0.7	0	0	3
Potato.....	1	0	6	30
Bacon (cooked).....	5	15	0	155
Cream, 40 per cent. ....	1	12	1	120
Cream, 20 per cent. ....	1	6	1	60
Milk.....	1	1	1.5	20
Bread.....	3	0.5	18	90
Butter.....	0	25	0	225
Egg (one).....	6	6	0	75
Brazil nuts.....	5	20	2	210
Orange (one).....	0	0	10	40
Grapefruit (one).....	0	0	10	40
Vegetables, 5 and 10% groups.....	0.5	0	1	6

1 gm. protein, 4 calories.

1 gm. fat, 9 calories.

6.25 gm. protein contain 1 gm. nitrogen.

30 grams (gm.) or cubic centimeters (c.c.), 1 ounce.

A patient "at rest" requires from 25 to 30 calories per kilogram body weight.

1 gm. carbohydrate, 4 calories.

1 gm. alcohol, 7 calories.

1 kilogram, 2.2 pounds.

A convenient scale for weighing food is a movable dial spring balance.

Feeding is begun with food containing but small amounts of carbohydrate and lesser amounts of protein and fat. The most satisfactory diet to begin with is one composed exclusively of green vegetables of the "5 per cent. group" (see table). These vegetables, although they contain but little available nutriment, have a large bulk and serve to fill the stomach, thus allaying in some measure the pangs of hunger. The indigestible residue is valuable in preventing constipation. From 150 to 200 gm. of the vegetables of this group are given the first day. Approximately 5 gm. of *available* carbohydrates are contained in this amount. If no glycosuria occurs, the diet on the second day may contain vegetables equivalent to five more grams of carbohydrate, and this increase is made daily until 20 gm. of carbohydrate are given. Following this, 5 gm. are added every other day until glycosuria occurs or the patient is receiving as much as 3 gm. of carbohydrate per kilogram of body weight in twenty-four hours (Joslin). After the first day or two carbohydrate may be given in the form of vegetables of the 10 per cent. group, followed subsequently by those of the 15 and 20 per cent. groups. Fruits are then added, and ultimately, if glycosuria has not supervened, bread and oatmeal.

Vegetables are best cooked by steaming in a double boiler, as in this way nothing is lost.

Ordinary bread is but seldom included in the dietary of the diabetic. There are on the market a large number of brands of "gluten" and "diabetic" flour which contain relatively little carbohydrate and much protein. Bread made from such flour, provided the composition is accurately known, is satisfactory. These special brands of flour, however, are expensive and many are fraudulent.

The patient's longing for bread may, in a measure, be satisfied by bran biscuits. These contain no carbohydrate and serve as a convenient vehicle for the administration of butter or other fats. The bulky residue fills the stomach and relieves constipation.

The recipe used at the Rockefeller Institute Hospital is:

Bran .....	60 gm.
Salt .....	$\frac{1}{4}$ teaspoonful
Agar agar, powdered .....	6 gm.
Cold water .....	100 c.c. ( $\frac{1}{2}$ glass)

Tie bran in cheese cloth and wash under cold water tap until water is clear. Mix agar agar in the water (cold) (100 c.c.) and bring to the point of boiling. Add to washed bran the salt and agar agar solution (hot). Mold into three cakes. Place in pan and, when firm and cold, bake in moderate oven from forty-five to fifty minutes.

The appearance of glucose in the urine means that the patient's assimilative limits have been exceeded, and a fast must be instituted until the glycosuria ceases. Following the fast, the carbohydrate ration should be diminished by one half and not increased beyond this amount for some days, and then very cautiously. The amount should be kept well within the limit of tolerance previously determined for a considerable period of time. Subsequently, if there is reason to suppose the patient can assimilate more carbohydrate, the limit of tolerance may again be determined by gradual addition of carbohydrate, even to a point in excess of the former tolerance.

In severe cases some patients cannot assimilate even the small amount of carbohydrate contained in green vegetables, although they may still be able to assimilate minimal amounts of protein and fat. Such patients may be given at first green vegetables that have been cooked in three changes of water and the water discarded. Vegetables so prepared contain practically no carbohydrate.

*Addition of Protein to the Diet.*—In severe cases of diabetes, it is advisable to determine the protein tolerance in essentially the same way that carbohydrate tolerance is determined, eggs and meat alone being fed in increasing amounts until glycosuria occurs. In most cases of diabetes, however, protein may, to advantage, gradually be added to the diet during the period of testing the carbohydrate tolerance. During the first week of green vegetable feeding, provided no glycosuria occurs, two or three eggs may be given during the day. Lean meat is then added from day to day in amounts corresponding to 10 or 15 gm. of protein (see table) until the patient is receiving daily about 1 gm. of protein per kilogram of body weight, or if the carbohydrate tolerance is zero, only 0.75 gm. Later, if

desired, protein may be raised to 1.5 grams per kilogram of body weight (Joslin), provided, of course, this can be done without the development of glycosuria. Children may to advantage be given as much as 2 gm. of protein per kilogram.

*Addition of Fats to the Diet.*—When the amount of protein fed has reached 1 gm. per kilogram of body weight, fats may be added to the diet in gradually increasing amounts (25 gm. a day) until the caloric requirement of from 25 to 40 calories per kilogram of body weight is covered by the total food intake. Patients who are exercising require a higher caloric intake than when resting, and growing children up to as much as 50 or 60 calories per kilogram, depending on the age. The caloric intake should eventually be such that a progressive loss of weight does not occur. On the other hand, the patient must not gain in weight, or, more correctly, he must not gain in adipose tissue, though muscular development is allowable.

Fat, besides that obtained in the eggs and meat fed, may be supplied in the form of bacon, cream, olive oil or butter. If marked acetonuria appears, it is advisable to substitute olive oil for butter and cream.

*Weekly Fast Days.*—For a long time it has been recognized that days of partial or complete fasting are of benefit to the diabetic. Allen has incorporated this idea into his system of treatment, and advises frequent fast days. Joslin's rule is to fast all patients once a week whose tolerance for carbohydrates is less than 20 gm. When the tolerance is between 20 and 50 gm., 5 per cent. green vegetables and one half the usual quantity of protein and fat are allowed on the fast days; when the tolerance is between 50 and 100 gm. of carbohydrates, the 10 and 15 per cent. vegetables are allowed as well. If the tolerance is more than 100 gm. of carbohydrate, the carbohydrate intake is halved on the weekly fast days.

*Exercise*—This forms a valuable adjunct in the treatment of diabetes. It serves to raise the carbohydrate tolerance and to build up active protoplasmic tissue at the expense of fat. In addition, the patients who exercise feel better and take more interest in life.



The appetite is increased, but the increase is not greater than the increased assimilative power. Allen advises active exercises for practically all diabetics. Strong patients may begin exercise during the preliminary fasting period; weaker ones, during the period of dieting. Exercise is especially advantageous immediately following a meal containing carbohydrate. Short periods of vigorous exercise are preferable to long continued monotonous walks. The patient should stop just short of uncomfortable fatigue. In children, exercise is of especial benefit, as it aids in the building up of muscular tissue and favorably influences growth.

*Acidosis.*—In the course of diabetes, large amounts of the “acetone bodies,” namely, acetone, aceto-acetic acid and beta-oxybutyric acid may be produced. These substances, for the most part, are products of the incomplete combustion of fats, and appear when there is a disproportionately great metabolism of fat as compared with carbohydrate. For the complete combustion of fat, it seems essential that a certain amount of carbohydrate be simultaneously burned. Under the older methods of treatment the production of large amounts of the acetone bodies at some stage of the disease was usual, and, as a result, a large proportion of all diabetics, and especially younger patients, ultimately developed coma—presumably as a direct result of overproduction of the acetone bodies. By strict adherence to the rules of treatment already formulated, it is usually possible to reduce the production of acetone bodies to a minimum.

For the detection of acetone bodies in the urine, two tests are in general use, the nitroprussid reaction (Legal, Arnold, Rothera) and the ferric chlorid reaction (Gerhardt). The nitroprussid test is a very delicate one for either acetone or aceto-acetic acid. The ferric chlorid test is a less delicate one and serves to detect aceto-acetic acid. Since amounts of aceto-acetic acid smaller than are required to give the ferric chlorid reaction are of no especial significance, there is, in general, no reason for using the more delicate nitroprussid test. If one of the acetone substances is present in the urine, all are present, and there is no indication for testing for more than one of them. The

ferric chlorid test is carried out by adding to the urine a strong solution of ferric chlorid until no further precipitation of phosphates occurs; a purple color indicates the presence of aceto-acetic acid. Salicylates give a similar reaction, but the color may be obtained after the urine has been boiled for a few minutes, whereas aceto-acetic acid is destroyed by boiling.

Of the acetone substances, acetone itself is an adventitious decomposition product of aceto-acetic acid, and is probably never formed in sufficient quantity to do harm. Aceto-acetic acid and beta-oxybutyric acid, however, are fairly strong acids, and for that reason are capable of doing much harm to the organism by the neutralization and removal of the available bases. Acids of one kind or another are always being produced in the course of metabolism, and the body possesses an efficient mechanism whereby these acids may be neutralized or excreted. A slight excess in acid production, such as a few grams of beta-oxybutyric acid, can be completely compensated for. With a larger production of acids, especially if continued over a considerable time, the compensatory mechanism of the body may become overtaxed, with the result that an actual depletion of the alkali reserve of the body fluids and tissues occurs. Such a condition is known as acidosis. In diabetes, the appearance of acetone bodies in the urine signifies that the ideal result of treatment has not been attained, but it does not necessarily mean that acidosis is present. Qualitative tests alone on the urine are not sufficient either to confirm or to exclude acidosis, as a strong test may be obtained when no acidosis is present, and only a faint reaction at the height of the coma of acidosis.

A high excretion of ammonia in a twenty-four hour specimen of urine is an indication of abnormal activity on the part of the defensive mechanism of the body, and is a warning signal. Among the symptoms of incipient acidosis are indefinite malaise, headache, slight nausea, neuralgic pains, etc. In other words, they are extremely variable. Certain symptoms, as increasing drowsiness and deep breathing of the "air hunger" type (acyanotic hyperpnea), may indicate to the skilled observer the onset of acidosis; but for an

accurate quantitative idea of the degree of acidosis determinations on the alveolar air or blood must be made.

*Alveolar Air.*—In acidosis, there is a diminished carbon dioxid tension in the alveolar air. The determination of this tension is a simple bedside procedure. Marriott described a rapid clinical method for the purpose, for the details of which the reader is referred to the original paper (*Jour. A. M. A.*, May 20, 1916, p. 1594). It is important that the degree of acidosis be known, especially during the fasting period, since failure to recognize a progressive acidosis may result in serious or even fatal consequences.

The  $\text{CO}_2$  combining power of the blood plasma as determined by the Van Slyke method is probably the method of choice in determining degree of acidosis. This test can be easily performed in any good laboratory. It requires special apparatus and a little more than ordinary technical skill.

According to Stillman, diabetics may react in a number of ways to their preliminary fast, as regards the development of acidosis. Some show no significant acidosis either before, during, or after the fasting period. Others, with a severe grade of acidosis existing before the fast, improve during the first fast, or during the subsequent fasts. A third group shows a fairly constant, low grade acidosis, not especially influenced one way or the other by the fast, but often relieved by subsequent, frequently repeated fasts, alternating with periods of low diet. A fourth group develops increasing acidosis during the fast, which may even become of a sufficient degree to prove fatal.

With proper dietetic regulation, the development of acidosis of a serious grade is unusual. The treatment of acidosis is mainly dietetic and preventive. Patients who show a tendency to acidosis while on a diet otherwise suitable should be frequently fasted. As has been mentioned, however, a few patients develop acidosis of an alarming grade during the fasting period, as shown by the characteristic symptoms and by a progressive fall of the carbon dioxid tension of the alveolar air. The normal tension is in the neighborhood of 40 mm.; a tension as low as 35 mm. may

be considered as insignificant; tensions below 35 mm. indicate acidosis, and 20 mm. is to be considered the danger point. When such a degree of acidosis is approached during a fasting period, the indication is to break the fast by allowing a restricted diet, chiefly of green vegetables. In such cases, subsequent fasting frequently causes the acidosis to disappear.

*Alkali Therapy.*—Dietetic treatment prevents the formation of acetone bodies and is the rational treatment for acidosis. Occasionally, however, the acidosis may become of such a grade that the administration of alkali is required. Alkalies neutralize acids already produced and replenish the depleted alkali reserve of the body, but have no effect in inhibiting the production of acids. Alkali administration is merely a temporary means of checking acidosis, but a valuable procedure when acidosis is of a severe enough grade to threaten life. Alkali therapy should not in any measure replace dietetic regulation and should be used only to tide the patient over a critical period. Alkali is indicated when, as a result of the patient's failure to observe dietetic regulation, the alveolar carbon dioxid tension has fallen to 20 mm. or lower, or if coma is present, or obviously impending, and also when, as a result of fasting, progressive acidosis occurs which is not promptly checked by feeding green vegetables.

Alkali in the form of sodium bicarbonate may be administered by mouth, by rectum, intravenously or subcutaneously. The amount necessary is determined by the degree of acidosis, the size of the patient, and the therapeutic result obtained as gaged by rise in carbon dioxid tension and symptomatic improvement.

Sodium bicarbonate in solution may be given by mouth. In adults, it is usually futile to give less than 4 gm. at a dose, which may be repeated every four or five hours. Doses larger than 15 gm. are generally not well tolerated. Alkali should be continued until the alveolar carbon dioxid tension has risen above 30 mm.

By rectum, the drop method should be utilized, giving equal parts of physiologic saline and 4 per cent. sodium bicarbonate solutions.

Many diabetics, especially those approaching coma, are unable to retain alkali when given by mouth, on



account of nausea and vomiting. In such cases and, in all serious cases in which alkali is required, intravenous injection is the method of choice. A 4 per cent. solution of sodium bicarbonate may be used and as much as 500 c.c. injected slowly at a time. The injection may be repeated as often as indicated by the alveolar air findings or by the symptoms. Since boiling changes bicarbonate into carbonate it is necessary to have the bicarbonate solutions specially prepared either by filtration through porcelain filters or using chemically pure bicarbonate in sterile water or physiologic saline solution.

#### TREATMENT OF ACIDOSIS

Stillman (*Arch. Inter. Med.*, 24, 445 (October), 1919) suggests that active treatment be instituted for severe acidosis when the plasma bicarbonate  $\text{CO}_2$  falls below 30 volume per cent. In addition to giving 3 gm. of sodium bicarbonate per hour dissolved in cold water, he administers fluids by the mouth to the patient's limit, but not to the extent of causing nausea. It has been attempted to give 5,000 c.c. in twenty-four hours. Clear, strong coffee has been given to stimulate the renal action. Finally active catharsis by calomel and salts together with high colon irrigations have been instituted and the effects clinically have seemed beneficial. Continuous fasting has been applied directly and if from six to twelve hours' fasting together with the treatment described did not cause an increase in the plasma bicarbonate, light feeding was begun. This consisted principally of protein. As has been pointed out, carbohydrate is not burned in such cases, thus leading to the severity of the diabetes, and fat leads to the formation of ketone bodies and consequently direct increase in acidosis. Therefore, from 600 to 800 calories have been given in the form of eggs and lean meat.

#### INDIVIDUALIZATION OF THE DIABETIC

Diabetics differ, as do normal persons, in many ways, and each patient should be treated according to the findings in his case. Thus individual diabetics vary greatly, not only in their ability to metabolize food

without the appearance of sugar but also as to the factors which may produce symptoms of acidosis. Likewise diabetes may be complicated by other constitutional diseases, such as tuberculosis and syphilis, and it is a delicate problem to determine how far one may go to influence one condition favorably without producing great harm as related to the other.

From what has been written it is quite apparent that the treatment of diabetes requires special knowledge and constant and intelligent care. Drugs, with the exception of the alkalies, are worthless, "organo-therapy" in real diabetes is a failure, many of the so-called "diabetic foods" are fraudulent, a *laissez faire* policy is fatal. The disease is combated only by management of the diet, which requires as nice discrimination in its use both as to quantity and quality as does any drug. Cooperation on the part of the patient is another requisite. When proper care and satisfactory cooperation can be obtained, the results are usually satisfactory.

#### COMPLICATIONS AND SEQUELAE

It should be remembered that a generalized and persistent furunculosis may be an unpleasant accompaniment of diabetes. Diabetic gangrene is another condition which may appear in the course of this disease and necessitate operation. Operations on diabetics are notoriously dangerous and usually undertaken only when deemed a life-saving measure.

Addis (*Jour. A. M. A.*, April 3, 1915, p. 1130) considers the necessary preparation of diabetics for operation. One method of preparing diabetic patients for operation is to give them a sugar and starch-free diet. This is a useless procedure, according to Addis, because, although it may reduce the degree of hyperglycemia and the amount of sugar in the urine, it will not lessen any of the risks of operation; it is dangerous, since it increases the chances of the onset of diabetic coma. When operation is not immediately necessary, and especially in those cases in which the decision as to whether or not an operation shall be performed rests largely on the question as to how much danger would be run by the patient after the operation because

of his diabetic condition, it would be a great advantage to have some objective data to supplement the facts relative to this point, which can be gained by clinical observation. The quantity of sugar in the urine is no aid in this respect, for the special danger to life is the failure, not of the sugar, but of the fatty acid metabolism. The coma in which diabetic patients die after operation is, often at least, accompanied by the excretion in the urine of large amounts of unoxidized fatty acids, and there is good reason for believing that the condition is due to poisoning by these acids. The inability of the kidneys to excrete large amounts of fatty acids is a factor in the production of diabetic coma. The giving of alkali helps the kidneys in this work. Before operation, therefore, it is important to deprive the patient of fats for several days and to give alkali until the urine becomes alkaline, and to maintain if possible this alkaline reaction after operation. Neither success in inducing a storage of glycogen in the body before operation, nor in keeping the urine alkaline is an absolute barrier against diabetic coma. They are only palliative measures. All those circumstances which unite together to produce shock are factors which act as exciting causes of the condition known as diabetic coma. It is possible to mitigate the action of these agencies by the application of the principles of "anoci association."

### DIABETES INSIPIDUS

This condition is recognized by the excretion of large quantities of non-sugar-containing urine, not directly due to an excessive intake of fluids (polydipsia). Connected etiologically with this condition the following have been mentioned: cerebral irritation, diseases and injuries of the cerebrum, diseases of the pituitary body and, finally, a primary cause in the kidney.

The diagnosis of the cause of diabetes insipidus having been made, the treatment may be aimed more or less successfully to cure the condition, or to prevent the operation of the cause. A simple polyuria from overdrinking can, of course, be easily prevented. Nervous

causes may be modified if there is not actually some pathologic condition in the brain. If the blood-pressure is high, the lowering of it by proper baths, massage, physical exercise, change to a warm climate, diet, or by vasodilators will prevent it. Polyuria may, however, occur with low blood pressure, caused by some disturbance of the brain, as theoretically low blood pressure should not cause diabetes insipidus. Such instances may be helped by the vasoconstrictor drugs, and especially by ergot. It is possible that this effect of ergot is due to its action in preventing cerebral irritation, cerebral congestion, and possibly the slight cerebral exudate that may occur. There seems to be a definite relationship to pituitary gland disturbance in many cases and Lereboullet and others claim subcutaneous injection of pituitary extract has symptomatic benefit.

### PELLAGRA

The zeistic theory of the origin of pellagra is not yet entirely abandoned, and some students of the subject are still endeavoring to connect the incidence of pellagra with some factor related to maize, or Indian corn, in the diet. Interest also centers in the broader hypothesis that pellagra is due to some communicable factor and should be placed in the category related to that of infectious disease or that it is essentially a deficiency disease. The Thompson-McFadden Pellagra Commission has stated that its efforts to discover the essential pellagra-producing food or the essential pellagra-preventing food have not been crowned with success. Their evidence suggests that neither substance exists in the population studied by them. Hence they have been inclined to postulate a communicable agency in the etiology of pellagra. In recent studies in South Carolina they found new cases of pellagra always occurring in communities where old ones existed, and also that improved sewage arrangements favorably influenced prevention of new cases. Goldberger of the U. S. Public Health Service and his associates announced the experimental causation of pellagra in a group of human beings, as well as the cure and prevention of the disease among three groups of persons widely separated from each other geographically. As



a result of epidemiologic studies, Goldberger concluded that pellagra is not a communicable disease, that it is dependent on some as yet undetermined fault in a diet in which the animal or leguminous vegetable component is disproportionately large, and that no pellagra develops in those who consume a mixed well-balanced and varied diet. Positive experiments in feeding have led to the more definite belief that pellagra is a nutritional disturbance and should be treated on that basis. This is the view having greatest credence and support today and indeed, the establishment of proper feeding seems to have lowered greatly the incidence of pellagra in the southern part of the United States.

#### TREATMENT OF PELLAGRA

According to Voegtlin (*Jour. A. M. A.*, Sept. 26, 1914), all physicians who have had much experience in the treatment of pellagra agree on one point; namely, that in the milder cases the symptoms will almost always disappear in a relatively short time if the patients are kept in a hospital, at rest, on a liberal mixed diet, with plenty of fresh meat. He has found drugs of little value but calls attention to the use of arsenic, which has been highly recommended by Lombroso. He warns especially against placing the slightest faith in proprietary pellagra "cures."

In the hygiene of the disease, of greatest importance is the avoidance of direct sunlight except in spring and summer. There seems to be no doubt that the skin of the pellagrin is hypersensitive to sunlight.

*Diet.*—Corn bread and corn products are prohibited until the zeistic theory is disproved, as a precautionary measure. The diarrhea does not indicate a limitation in the dietary regimen. Steak, roast beef or mutton may be allowed once or twice daily; if the mouth is too sore to allow chewing, beef or white meats, either scraped or ground, may be substituted. Eggs are generally permissible. Sweet milk is valuable when it agrees with the patient. Fresh or artificially soured buttermilk is nearly always suitable. The patient should be nourished to the limit of assimilation. Goldberger advises that beans and peas

may be eaten if fresh meat cannot be secured. In the winter the dried, not the canned, variety of the vegetables should be as large a part of the diet as they form in summer. Vedder has formulated the following simple rules for the prevention of deficiency diseases:

1. In any institution where bread is the staple article of diet, it should be made from whole wheat flour.
2. When rice is used in any quantity, the brown undermilled, or so-called hygienic, rice should be furnished.
3. Beans, peas or other legumes known to prevent beriberi, should be served at least once a week. Canned beans or peas should not be used.
4. Some fresh vegetable or fruit should be issued at least once a week and preferably twice a week.
5. Barley, a known preventive of beriberi, should be used in all soups.
6. If cornmeal is the staple of diet, it should be yellow meal or water-ground meal, that is, made from the whole grain.
7. White potatoes and fresh meat, known preventives of beriberi and scurvy, should be served at least once a week, and preferably once daily.
8. The too exclusive use of canned goods must be carefully avoided.

As an illustration of the practical application of the above recommendations for a health-preserving, pellagra-preventing diet, Goldberger presents the following bill of fare: *Breakfast*—Sweet milk, daily; boiled oatmeal with butter or with milk every other day; boiled hominy grits or mush with a meat gravy or with milk every other day; light bread or biscuit (one-fourth soy-bean meal), with butter, daily. *Dinner*—A meat dish (beefstew, hash, or pot roast, ham or shoulder of pork, boiled or roast fowl, broiled or fried fish, or creamed salmon or codfish cakes, etc.), at least every other day; macaroni with cheese, once a week; dried beans (boiled cowpeas with or without a little meat, baked or boiled, soy beans with or without a little meat), two or three times a week; potatoes (Irish or sweet), four or five times a week; rice, two or three times a week, on days with the meat stew or the beans; green vegetables (cabbage, collards, turnip greens, spinach, snap beans or okra), three or four times a week; corn bread (one-fifth soy-bean meal),

daily; buttermilk, daily. *Supper*—Light bread or biscuit (one-fourth soy-bean meal), daily; butter, daily; milk (sweet or buttermilk), daily; stewed fruit (apples, peaches, prunes, apricots), three or four times a week, on days when there is no green vegetable for dinner; peanut butter, once or twice a week; syrup, once or twice a week.

This bill of fare is primarily for older children and adults. The intelligent housewife will make such modifications as the age of her children, tastes and particular circumstances make necessary. The quantities of some of the foods may be reduced and replaced, in part or in whole, by other similar foods, but so far as possible no reduction should be made in the quantities of milk and lean meats. In the case of young children eggs make a very desirable addition and the relative quantity of milk allowed them may advantageously be increased.

#### MEDICAL TREATMENT OF PELLAGRA

As has been said, experiments with the feeding of pellagrins along the lines outlined by Goldberger have resulted in marked improvement, and as a result, much of the hypermedication formerly administered to patients with this disease has been discontinued. However, the symptoms of the condition are frequently severe, and these should be alleviated by appropriate measures. The diarrhea, the constipation, the sore mouth, the nausea, or other concomitants of this disease should be treated by the usual measures employed. The simple erythematous rashes or even sloughs of the skin of the hands and feet may be benefited by bland ointments such as zinc oxid or weak boric acid. Raw or weeping surfaces may be soothed by calamine and zinc oxid lotion in lime water. If there is intense burning of the hands and feet, cold compresses of a mild solution of phenol; 60 grains to the pint of water may be applied to the unbroken skin. Neuralgic pains may be treated by the usual dosages of acetanilid or acetylsalicylic acid.

Hydrotherapy has in many instances proved so beneficial in pellagra that some form of it, such as hot or cold baths, simple or medicated douching, packs,

moist or dry rubs, accompanied by special massage, may be employed in nearly every case. Increased oxidation of the tissues, more rapid elimination, greater metabolic activity, sharpened appetite, improved digestion and assimilation, and a noticeable tonic effect on the whole living organism follow their use.

## GOUT

### ETIOLOGY

The exact etiology of gout is as yet unknown. There are, however, numerous factors so constantly associated with this condition as almost to assume the nature of primary etiologic influences. The disease seems primarily to be a hereditary or acquired inability of the patient to properly metabolize purin bases. The disease occurs usually among the well-to-do; those who are heavy eaters or indulge in alcohol, and it is commonly associated with mental strain, fatigue or history of exposure.

### SYMPTOMATOLOGY

The symptom ordinarily considered almost pathognomonic of gout is the occurrence of sudden pain in a metatarsal phalangeal joint, associated with all the signs of acute inflammation such as redness, swelling, temperature, moderate leukocytosis, etc. Accompanying the acute attack there is an excess of uric acid in the blood and urine, but the excretion of both endogenous and exogenous uric acid is diminished except during the acute seizure. In the chronic form of the disease the joints affected become thickened and deformed, tophi form, chalky deposits develop, and the patients suffer with shooting pains, increased arterial tension and gastric disturbances. The tophi will be found to consist of urates.

### TREATMENT

In view of our inexact knowledge of the etiology of this disease, treatment is directed toward increasing the elimination of uric acid and lessening its formation.

The food of the gouty patient must be regulated from every point of view; the intake of purins must be restricted; the intake of carbohydrates must be controlled to avoid glycosuria, from which gouty patients



sometimes suffer; the habits of the patient must be regulated to secure proper eating and elimination of waste products. Chace has outlined a diet free from purins for use during the acute attack of gout:

*Breakfast:* Apple or banana, cream of wheat or farina with cream and sugar, one egg, cup of cereal coffee with cream and sugar, toast and butter.

*Dinner:* One egg, baked potato with butter, string beans, rice or macaroni, baked apple with sugar, a glass of milk.

*Supper:* Rice with butter, cream cheese, bread and butter, stewed pears, rice pudding.

By determining the eliminative capacity of the body for exogenous uric acid, it is possible to keep the intake of purins well within the limit. The continuous use of alkaline drinking waters causes a deposit of sodium urate in the joints and cartilages, and such drinks should be forbidden. Salt should be used very sparingly also, as it tends to the formation of the sodium urates. Tea, coffee and cocoa are especially rich in purins. Fresh vegetables, except beans, peas and the various cereals, except oatmeal, may be freely eaten.

*General Measures.*—Again it must be stated that patients differ and that the methods which are extremely successful with one may fail utterly with another. The patient must be individualized. Diet may produce marked improvement with no other measures, but it is better to make the patient's whole life hygienically efficient. If his habits are sedentary he should be encouraged to outdoor life with suitable exercise. He should, however, be protected from undue exposure to the elements. All excesses should be subdued. Treatment at spring resorts is sometimes efficacious through the ability to enforce a hygienic régime when such efforts have failed at home.

*Medicinal Treatment.*—In an acute attack proper care must be given to the affected joint. Those measures which have been recommended under acute rheumatic fever may be tried, especially wrapping the joint well in protective heating bandages and the local application of heat. The movements of the bowels and kidneys should be regulated and elimination through the skin encouraged by appropriate hot baths and packs.

The administration of the wine of colchicum, 8 to 15 minims (0.5 to 1.0 c.c.) has been the classical treatment for the acute attack in gout. During succeeding days half this dose is given. Colchicum may produce marked irritation of the intestines with watery stools and pain. This should be taken as evidence of sufficient action and the drug stopped. In non-nephritic cases salicylates may be given to encourage the elimination of uric acid. More recently phenylcinchoninic acid or cincophen, formerly called atophan, has been widely used. It seems to have a selective action on the excretion of uric acid. The drug should be administered every three hours, as its action diminishes rapidly. In the acute attack of gout it is sometimes beneficial in reducing pain. It should probably be the drug of first choice in the medicinal treatment of this disease. In acute gouty attacks it relieves more promptly than colchicum and without undesirable by-effects.

### OBESITY

Obesity is a condition accompanied by the accumulation of extraordinary, therefore pathologic, quantities of fat. Unless causing definite functional disturbance, no treatment is necessary. A reference to the table of height and weight at varying ages in the front section of the book will indicate what is normal.

The treatment of obesity must include primarily a regulation of the diet to prevent the feeding of excess food over what the body can utilize and a regulation of body work to produce a demand for energy-giving constituents.

### DIET

The number of diets which have been offered for obese persons is almost legion. Certain general principles must be observed. An average of several of the best known diets is as follows: Protein, 140 gms., fat, 40 gms., carbohydrates, 90 gms., calories, 1,320. It can be taken as a matter of fact that most people eat too much. The appetite may be better controlled and hunger appeased by small quantities of food taken frequently. Depressing of the appetite is commonly advised and may be accomplished in several

ways, notably by long chewing of the food and limitation of the variety. Peppermint lozenges and menthol tablets reduce the sensibility of the mucosa of the stomach and minute doses of camphor seem to produce a feeling of fullness. Coffee taken early in the meal has long been advocated by Steinberg as it reduces appetite and lessens the usual desire of the overcorpulent to sleep.

Friedenwald and Ruhrah give the following general directions: Avoid sugars and starchy food and take little or no fatty food. Eat sparingly and take but little fluid—and that apart from meals. Obese persons may eat small quantities of chicken, beef, oyster, bouillon or clam soups; meat once daily consisting of beef, lean, raw, scraped, boiled or broiled; steak, broiled; mutton, roasted; chops, broiled; chicken, boiled or broiled. Eggs should be only soft boiled or poached. Of fish the following may be taken: oysters, raw; mackerel or trout. Of bread, but a small quantity should be allowed and then only in the form of stale wheat bread, zwieback, toast, graham or gluten bread. The following fruits, all of which are acid, may be recommended: lemons, oranges, raw apples, grapes, raw peaches, berries and cherries. Water should be taken sparingly at meal times. Tea and coffee may be taken but without sugar or milk. Mineral waters ordinarily may be allowed in quantity sufficient to assuage thirst without causing disagreeable symptoms.

The following articles of diet should not be taken: rich soups, fried foods, pork, veal, stews, hashes, potted meat, liver, duck, goose, sausage, crabs, lobsters, preserved fish, salmon, bluefish, herring, hominy, oatmeal, rice, puddings, sardines, potatoes, turnips, carrots, parsnips, sweet potatoes, beets, hot bread or cakes, nuts, candies, pies, pastry.

#### HYDROTHERAPY

The use of cold baths in the treatment of obesity, as well as special forms of hydrotherapy, is generally well known. Besides improving the skin and aiding the circulation, it seems likely that such baths also accelerate the loss of fat.

## EXERCISE

In the presence of circulatory disorders, the prescribing of exercise must be cautious; otherwise it is a valuable aid in producing loss of weight.

Walking and horseback riding, swimming and graded calisthenics, may be of value. Golf and tennis may be likewise indicated if the physician thinks proper.

Massage (if given vigorously and accompanied by passive motion) sometimes produces marked results, especially in those of established sedentary habits.

The Zander apparatus produces passive mechanical exercise. Besides such machines others combining weight lifting, pushing, pulling and stretching movements may be employed in suitable cases.

## MEDICINAL TREATMENT

Obesity cures of a fraudulent nature are legion. In most instances they are either dangerous or worthless, or both. Thyroid extract has been and still is the basis of many so-called "fat reducers." Lemon juice has had its day and numerous iodid preparations have been exploited. Bladderwrack, a form of seaweed, has likewise had a peculiar vogue.

Von Noorden believes there is an endogenous constitutional type of obesity which he regards as traceable to thyroid functioning. Congenital or acquired weakness or degeneration of the thyroid may induce the obesity directly or the thyroid may become a factor in the obesity only secondarily; disease in the ovary or testicle (deficiency of the interstitial substance); disease in the pituitary body (adipose-genital dystrophy); disease in the pineal gland or thymus (both dubious). There may also be a combination of both the exogenous and endogenous type, especially in the young.

Throughout the endogenous forms, abnormal thyroid functioning is common to all, and treatment of constitutional obesity must be based on thyroid treatment. It is unquestionable now that the reliance on thyroid treatment is increasing, the dread of it diminishing.



The dangers from thyroid treatment are just as great as ever, but we know better how to watch out for them and guard against them. He adds that even in cases amenable to systematic dietetic measures alone, the prolonged restriction of the diet seems to him more of an evil than a course of thyroid treatment. With this the diet need not be so strictly regulated and the effect of the thyroid treatment is often permanent, so that the patients can eat like other people afterward without bringing back the obesity. During the thyroid course ample provision of albumin should be ensured. The urine should be examined often for sugar. The tendency to acceleration of the heart action and to lowering of blood pressure can be warded off by daily small doses of some digitalis preparation. The thyroid seems to lead to an increase of oxygen consumption and carbon dioxid excretion. If used it may be given in doses of one to two grains twice or three times daily and increased only very cautiously.

#### ROUTINE OF TREATMENT

The patient who wishes to be scientifically treated for obesity must be willing to place himself unreservedly in the hands of his physician for a long period of time, six months to a year, and to obey all instructions implicitly. The treatment is begun by a study of the patient's habits as to life and diet. Mild exercise and restrictions of the diet gradually become increasingly severe and strenuous, and during the second or third month, massage, use of mechanical apparatus and organotherapy may be attempted. The patient should be weighed regularly with and without the clothing. The patient will have much to overcome in the way of advice and ridicule from friends, and the physician must, as suggested by Romero, be on the lookout for complicating factors in his case raised in this way. As has repeatedly been shown both by medical and non-medical experiments in the reduction of weight of groups of the obese, systematic controlled treatment by appropriate measures is almost invariably successful.

# DISTURBANCES OF THE HEART

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Of late years the disturbances of the heart are beginning to assume a more prominent place in the list of causes of death. Only tuberculosis and kidney disturbances are more prominent. Although the majority of sudden deaths are due to a cardiac cause, there are few chronic diseases so amenable to treatment and so compatible with long life and comfort, if judiciously handled, as cardiac cases. Of late years also there have come into prominence numerous delicate methods of examining the heart's functioning, testing its rate and its rhythm. These newer methods have pointed the way toward efficacious therapeutic measures.

## THE PREVENTION OF CARDIAC DISTURBANCES

Although we shall consider under each heading the various elements in the etiology, it may be worth while here to take up some of the more general factors which produce cardiac disturbances.

Recent studies of focal infections have shown that a tonsillitis, an abscessed tooth, or other focus of infection may be the origin of germs that later may cause an endocarditis, or valvular infection. Patients are likely to manifest a desire to become active too soon after a serious illness or a surgical operation. The physician or surgeon should not submit his patient to such strenuous cardiac tests. If the patient manifests a marked rapidity in the heart rate on first sitting up in bed, cautious consideration should be given to his symptomatology before allowing him to arise. All physicians are probably familiar with the serious cardiac disturbances in young men who have indulged too vigorously in modern athletic competition.

## HYPERTENSION

### THE BLOOD PRESSURE

It is presumed that the physician is familiar with the methods of determining the systolic and diastolic blood pressures and with the significance of variations

in the readings from the normal. The average pressure pulse is about 35 to 40 mm. (difference between systolic and diastolic pressures). Faught states his belief that the relation of the pressure pulse to the diastolic pressure and the systolic pressure is 1, 2, 3. In other words, a normal young adult with a systolic pressure of 120 should have a diastolic pressure of 80, and therefore pulse pressure of 40. If these relationships become markedly abnormal disease is developing and imperfect circulation is in evidence, with the danger of broken compensation occurring some time in the future. It should be remembered that the diastolic pressure represents the pressure which the left ventricle must overcome before the blood will begin to circulate, that is, before the aortic valve opens, while the pulse pressure represents the power of the left ventricle in excess of the diastolic pressure. A high diastolic pressure is of serious import to the heart; a diastolic pressure over 100 is significant of trouble and over 110 is a menace. A pressure higher than 150 is serious, and anything over 200 usually indicates renal insufficiency.

#### ETIOLOGY OF HYPERTENSION

One of the most common causes of hypertension is excess in eating and drinking. The toxins from excess food are irritating, and therefore one of the first steps toward improving and lowering blood pressure in such cases is to diminish the amount of meat eaten or to remove it entirely from the diet. Alcohol, by affecting the appetite and increasing the amount of food taken, by interfering with the activity of the digestive tract, can indirectly disturb metabolism and thus affect the blood pressure. It should always be eliminated. Drugs or other substances that raise the blood pressure by stimulating the vasomotor center or the arterioles, when constantly repeated, may cause hypertension. This seems to be particularly true of caffeine and nicotine as taken in the form of coffee and tobacco. Thayer found a distinct relationship of hypertension to hard work. With such work is usually associated a hypersecretion of the suprarenals. Neurotic conditions, and in some instances neurasthenic conditions, may show

a blood pressure higher than normal. Lead may be a cause of increased blood pressure, and diabetics occasionally have a high pressure, although more frequently there is a lowering of blood pressure in diabetes. Syphilis, as shown by Riesman, Levinson and others, is a very common cause of hypertension and arteriosclerosis without renal disease. When arteriosclerosis and renal disease are combined, the highest systolic readings occur. Riesman, Hopkins, Gutmann, and more recently Engelbach (*Jour. A. M. A.*, **74**, 1619, June 12, 1920) have reported instances of hypertension referable to the menopause and alterations in the internal secretions. Engelbach found most of his cases associated with polyglandular insufficiency. In such cases treatment is pointed toward correcting the disturbed internal secretory balance.

#### PREVENTION OF HYPERTENSION

The physician should continually caution the patients in whom the factors leading toward hypertension exist against the many things which will propagate and prolong that condition. They should be cautioned against severe athletic competition, recreation excesses, excessive use of tobacco, alcohol, and caffeine, and overeating. The pregnant woman should be carefully watched for changes in the urine and in the blood pressure. Patients with infectious diseases should have a slow convalescence during which they are carefully watched in order to prevent throwing too great a strain on weakened organs.

Stoll has outlined a short series of "*Don'ts*" for patients with hypertensive cardiovascular disease, which are of distinct service in keeping the etiology and prevention of these conditions in mind:

1. Don't tell the patient with moderate hypertension, few symptoms and whose kidneys are functioning well to stop eating meat or to go on a milk diet.

2. Don't tell him to immediately give up his business; try to readjust his life so that unnecessary cardiovascular strain is reduced to a minimum.

3. Don't tell him his kidneys are "all right," just because his urine exhibits neither albumin nor casts.



4. Don't miss the significance of nocturnal polyuria and a persistently low gravity.

5. Don't give nitroglycerin tablets to your patient the moment you discover that he has hypertension. Perhaps he requires a high pressure to get the blood through his small inelastic vessels.

6. Don't be satisfied with the systolic pressure—the diastolic is often of more significance.

7. Don't attribute the insomnia, nervousness and headaches in the middleaged woman to "the change"—take her blood pressure and examine her eye grounds.

8. Don't make a diagnosis of neurasthenia till after a blood pressure estimation and a Wassermann test. It may save subsequent embarrassment and even be of advantage to the patient.

9. Don't think you are doing your whole duty to your pregnant patient when you have examined her urine. She may have hypertension but no albumin today and eclampsia next week.

10. Don't consider hypertension solely a condition of middle life; it is occasionally present in childhood.

11. Don't forget the old man's enlarged prostate. It may be the cause of the nephritic syndrome.

12. Don't hesitate to give digitalis when symptoms of cardiac failure are evident. It will not raise the blood pressure.

13. Don't wait until the patient is water logged and the heart dilated before suspecting a failing myocardium.

14. Don't deny your sleepless, gasping patient, whose course is nearly run, the relief that only morphin will give.

15. Don't make a prognosis solely on the blood pressure or the phenolsulphonephthalein test. Each tells but part of the story.

16. Don't overlook the fact that cardiovascular disease is to a certain degree a familiar condition sometimes present in several generations; nor neglect to explain the importance of a yearly blood pressure estimation of all members of the family.

17. Don't exclude syphilis, especially a parental infection, as the cause of the hypertension solely

because the Wassermann is a negative. Study the family history; examine the brothers and sisters, and your patient's children for signs of hereditary syphilis.

18. Don't fancy that the management of hypertension consists in watching a column of mercury or that success is measured in millimeters.

#### TREATMENT OF HYPERTENSION

Active treatment in hypertension should begin with a thorough cleansing of the gastrointestinal tract by purgation. Following this the most important measure in the management of high blood pressure is the proper regulation of the personal habits and diet. Constipation should be kept under control by feeding fruits and vegetables, avoiding those that produce flatulency. The embargo on meat foods should be absolute at first and these things added to the diet according to the response of the patient to them. Alcohol, tea and coffee should be forbidden. The patient should be encouraged to drink milk if it agrees with him. If the patient can be sure of good excretion, large quantities of fluid may be taken; but it is very important that the elimination be watched; if an appreciable portion of the fluid remains it adds quantity to the fluid in the blood vessels and thus does harm. Allen (*Jour. A. M. A.*, 74, 652 (March 6), 1920) has especially emphasized the value of salt restriction and water restriction in cases of so-called pure hypertension as well as in nephritis.

A patient with simple hypertension but otherwise well should have recreation periods one or more times a week and vacations not too infrequently. He should take a brisk purgative perhaps once in a fortnight or once in a week. Such physical methods as sweat baths, electric light baths and similar measures may be utilized as occasion demands. If there is insomnia a dose of chloral may be given as needed but this should not be continued over long periods. If any other drug is needed nitroglycerin may be tried. If arteriosclerosis is present sodium iodid in small doses, 3 grains (0.2 gm.) two or three times a day may be serviceable.

Probably the one measure of greatest importance in these cases is sufficient rest in bed. Freedom from either physical or mental strain is an important factor in lowering the blood pressure. Hydrotherapeutic measures, including the use of properly controlled heat and sweat baths, must be considered with relation to each patient's condition.

After a period which may be termed the normal period of hypertension in normal life, as age advances the systolic tension may lower, provided there is no kidney lesion. This is due to the slowly developing chronic myocarditis and a lessening of the tension and therefore lessening of the resistance to the heart.

When the blood pressure is suddenly excessively high from any cause venesection may be life saving and should perhaps be more frequently utilized than it is. It may save a sudden heart attack or a cerebral hemorrhage. Patients with high tension may be bled frequently and as much as half a pint taken at a time. Such treatment, however, will not long save life, as the blood pressure in most cases soon returns to its previous height.

#### DRUGS IN HYPERTENSION

The drugs that are most commonly used to lower blood pressure are the nitrites or drugs of that class including nitroglycerin, sodium nitrite, erythroltetranitrate and amyl nitrite. Other drugs more rarely used are iodids, thyroid, alkalies, chloral, bromids and very rarely aconite.

Amyl nitrite is required only when a sudden immediate effect is desired in angina pectoris or in some other serious spasmodic condition. Sodium nitrite is more likely to upset the stomach than is nitroglycerin. Its action is more permanent, however. The dosage is from 0.03 gm. to 0.06 gm. ( $\frac{1}{2}$  to 1 grain) best given in tablet form with plenty of water. The tablets may be crushed before swallowing. Nitroglycerin, in doses of from  $\frac{1}{500}$  to  $\frac{1}{100}$  grain, three or four times a day, in the form of a soluble tablet is a very popular drug. It acts in two or three minutes and the blood pressure may drop twenty or

more millimeters. Thyroid extract seems to act beneficially in many cases and if no tachycardia is present it may be tried.

Actually drugs, except at times organotherapy, promise very little in the control of this condition. Probably just as much can be accomplished through rest in bed, correct diet, free purgation, regulated exercise, venesection and appropriate hydrotherapeutic measures.

### ACUTE PERICARDITIS

Pericarditis is almost invariably a secondary condition, the most frequent infectious cause being rheumatism, others being cerebrospinal meningitis, acute miliary tuberculosis, pneumonia and sepsis. Accidental causes are traumatism, and an adjacent inflammation of the pleura. Pericarditis may also be terminal in nephritis, adjacent abscesses, cancer and other new growths. The most important sign for diagnosis is the so-called friction rub, usually best heard in the fourth and fifth interspaces near the sternum. It is caused partly by the exudate and partly by the state of the membrane.

### TREATMENT

Of primary importance in the treatment of pericarditis is rest. The patient should have absolute rest. He should not be allowed to sit up in bed, even to eat or attend to the calls of nature. He should have no visitors. Anything that increases the heart beat increases the irritation of the inflamed surfaces of the pericardium.

Just what can be done logically or generally to combat the inflammation actively must depend on the cause. When the inflammation occurs as a complication of acute rheumatism, it has been suggested that salicylates, which do not inhibit rheumatism and may be depressant to the heart, should be stopped if they are being administered; but if the salicylates are apparently improving the inflammation in the joints, pericarditis would not contraindicate their continued use. Except in large doses, salicylates probably do not depress the heart. In pericarditis it is generally well to administer an alkali in some form whether the



cause is rheumatism or not. A diminished alkalinity of the blood would always increase the likelihood of an augmented amount of pericardial or endocardial inflammation. Alkalis may be freely given. It is possible that one of the reasons why pericarditis or endocarditis occurs so frequently in serious prolonged fevers is that the patient has not eaten enough cereals or other carbohydrates, and the system has become more or less endangered by acidosis. In other words, carbohydrate starvation is inexcusable with our present understanding of the danger from even a diminished amount of alkalis in the blood.

The most valuable local treatment is cold, which may be applied either in the form of an ice-bag or by a small coil through which ice-water is caused to flow by siphonage. Cold may be applied more or less continuously, depending on the sensations of the patient. The bag or ice-cap must not be overfilled and must not be heavy, as the patient often cannot stand pressure over the pericardium. Sometimes the relief from pain and the diminution of the number of the heart-beats is marked, and from this reason alone the cardiac inflammation may be inhibited. If cold applications are not tolerated by the patient (and they often are not in children) warm applications may be used, such as cloths wrung out of hot water and covered with oil-silk, and the pain will often be relieved thus. While hot applications would not tend to abort the inflammation, they probably do not tend to promote it.

The intake of food and especially of fluids should be decreased but the nutrition of the patient should not be allowed to suffer.

A diminished diet, of small amount at a time, and such purging as the patient's strength will allow are essential in attempting to curtail the seriousness or amount of this inflammation. A too great quantity of fluids tends to increase tension and delay absorption.

*Stopping the Pain.*—Nowhere else in the body should pain be so speedily combated as when it occurs in the region of the heart. Morphin should be administered as needed to control the pain. The ice-bag may obviate the frequent need of morphin. If morphin is

contraindicated other sedatives may be employed. Depressing measures should not be resorted to unless the state of the circulation is good.

*The Exudate.*—It is not known how much is to be gained by indirect measures tending to prevent exudation and hasten resorption of the exudates. However, purging, diuresis and local application of blisters have been employed for these purposes. The saline purges should be used only if the heart is strong. If the circulation is weak, the vegetable purgatives or calomel may be employed.

For diuresis potassium citrate and, if deemed advisable, digitalis, may be employed. However, if there is associated myocarditis, digitalis is contraindicated.

If, in spite of all the therapeutic measures suggested, the fluid increases and the pericardium becomes more distended and the heart's action more labored, paracentesis must be done. The point where the aspirating needle should be inserted into the pericardium depends somewhat on the conditions in the individual case. It is often best to insert an exploratory needle first. In cases where the apex cannot be localized, the sixth interspace near the mammillary line is frequently the point utilized. Thayer suggests that the physician seek a point a little outside of the supposed position of the apex if it can be definitely determined that the heart is enlarged or dilated. Preliminary puncture will determine the fluidity and character of the exudate. If pus is found, a more radical surgical procedure than simple paracentesis must be done immediately. The point of puncture for aspiration most frequently chosen is the fourth or fifth intercostal space, about an inch to the left of the sternal margin. Paracentesis is also often done in the region of the normal apex beat. The position of the patient is determined by his dyspnea; he should lie in the position most comfortable for him. The fluid should be withdrawn slowly and the pulse carefully watched. The withdrawal of a small amount of fluid may later seem to be the starting cause of resorption of the rest of the fluid. On the other hand, it often accomplishes nothing but the removal of the immediate pressure, the fluid may again accumulate,

and more radical surgery must be performed. The amount of fluid withdrawn should not exceed 6 ounces at any one time.

*Convalescence.*—The convalescence should be prolonged as in any other cardiac inflammation. The patient should be given more and more nourishing food, and a capsule containing 0.05 gm. of quinin and 0.05 gm. of reduced iron, three times a day.

It is a question as to when patients convalescent from pericarditis should be permitted exercise. It has been thought that gentle movements and possibly exercise, sooner than theoretically justified, might cause the heart to beat a little more actively and possibly prevent the formation of tight adhesions between the two layers of the pericardium. Whether such activity of the heart will prevent adhesions is something that has not been determined.

Small doses of sodium iodid, perhaps 0.2 gm. (3 grains), two or three times a day, should be continued for some time. Iodid in this dosage does no harm and may do a great deal of good in these cases.

## MYOCARDIAL DISTURBANCES

The condition of the myocardium or heart muscle is often the determining factor as to whether a patient shall live or die. If the myocardium be degenerated at the end of a long severe illness, a too rapid attempt at a return to ordinary activities may bring about a dilatation of the heart which is itself responsible for sudden death or prolonged disability.

### HEART FUNCTION

As Sir James Mackenzie has repeatedly emphasized most important in the examination of the heart is the study of how it responds to effort. For this purpose numerous functional tests have been proposed, varying from simple effort to those requiring elaborate apparatus. Rapidity of the pulse and respiration two minutes after hopping a hundred times on one foot was the test utilized in Army examinations. A rise of blood pressure after exercise normally occurs within thirty seconds. If this is delayed to more than a minute the

heart's capacity has been exceeded. These function tests are of the greatest importance in outlining the patient's future work and habits.

### **Acute Myocarditis**

Practically all acute infections cause more or less myocarditis. It is exceedingly rare, indeed, that an endocarditis occurs without an accompanying myocarditis. The condition is not diagnosed until a sudden acute dilatation calls for emergency treatment.

The symptoms are often indefinite. If an acute myocarditis develops the apex beat is less positive, less accentuated and later diffuse and feeble. The closure of the aortic valve is less typically sharp, showing that the blood vessels are not so thoroughly filled. The peripheral circulation may not be active, the blood pressure falls, and the heart becomes more rapid, especially after exertion.

The prevention of this condition must be rest. Patients should not be allowed to attempt too rapid a convalescence after an infectious disease, a labor, or a surgical operation. Such cardiac tonics as digitalis should not be given; fluids should be diminished. Vaso-contractors such as ergot should not be given; large amounts of food should not be taken into the stomach at one time. Massage may be of service to promote return circulation to the heart. No cardiac debilitating drug should be administered when myocarditis has been diagnosed. The safest hypnotic is morphin in small doses. Calcium may be of value in this condition, and perhaps the best salt to administer is calcium glycerophosphate in doses of 0.25 gm. (4 grains) three or four times in 24 hours.

### **Chronic Myocarditis**

This is the term applied to a condition which is not an inflammation but a long continued degeneration. It is often a part of an arteriosclerosis. This being the case, the causes are all of the conditions which are associated with the appearance of arteriosclerosis: old age; syphilis; gout; repeated attacks of rheumatism; excesses, especially in food and alcohol; prolonged wasting diseases, such as tuberculosis or cancer. The



myocardial changes are sometimes associated with chronic pericarditis and chronic endocarditis, and may accompany or follow valvular diseases of the heart.

The symptoms of chronic myocardial degeneration are progressive weakness, slight at first, noticeable on exertion; the pulse frequently becomes more rapid. There is likely to be edema of the lower extremities toward night. The amount of urine may diminish. The pulse may become intermittent, then irregular.

The physical signs often show an enlargement of the heart. Such a heart may act perfectly until a sudden exertion causes it to weaken, giving cardiac distress signals, the patient becoming prostrated for a variable period. Slight cardiac pains and sensations referred to the cardiac region become frequent.

#### TREATMENT OF CHRONIC MYOCARDITIS

Patients with this disturbance should avoid physical effort and mental weariness; should avoid the swamping of the circulation with fluids; should reduce the quantities of food taken; should cause daily free movements of the bowels; should take warm baths daily to clean the skin and promote perspiration; should take a correct amount of cautious exercise or undergo carefully directed calisthenics or massage. The patient should avoid chilling the body or placing any other sudden strain on the weakened heart musculature. Complete rest one day a week and one month in the year will aid in prolonging life.

A diet of low protein content, from 60 to 70 gm. daily, especially if nephritis be associated, is better than the usual 120 gm. The intake of meat, strong soups and protein vegetables should be minimized and all articles causing intestinal fermentation eliminated. The dietary should, of course, be otherwise regulated to meet the individual case.

If there is a high blood pressure nitroglycerin or other nitrites may be given.

When an iodid is deemed advisable, the sodium salt is best, given either in a saturated solution or in a solution in water of which a dose would be a teaspoonful, well administered in milk.

There is no syrup or tasteful menstruum that will well disguise the taste of an iodid. It is much better to give these preparations in water and allow the patient to take them either in milk or effervescing water, or in any solution that he may prepare to suit his taste, or he may follow the drug with any taster that he desires.

	Gm. or C.c.	
R Sodii iodidi.....	20	or 3 v
Aquae...q. s. ad saturandum		

M. Sig.: Five drops, in water, three times a day, after meals.

[Each minim represents about .065 gram (1 grain) of the drug. A drop, however, of a saturated solution is less than a minim.]

If, in spite of this management and treatment, the patient has cardiac asthma attacks, with or without pain, especially if there are pendent edemas, the question arises as to whether or not digitalis should be given. In such cases one cannot tell without trying whether digitalis will be of benefit or will cause more discomfort. A small dose of an active preparation should be given at first twice in twenty-four hours, and after a week once in twenty-four hours, its action being carefully watched and the decision as to whether the dose is too large or too small arrived at.

## ENDOCARDITIS

Acute endocarditis rarely, if ever, occurs without some myocarditis, and not infrequently pericarditis also accompanies these conditions. Endocarditis is divided for discussion into acute mild (simple) endocarditis; acute malignant (ulcerative) endocarditis; chronic endocarditis and valvular disease.

### Acute Mild Endocarditis

It has been shown positively that acute endocarditis is due to micro-organisms, generally streptococci, staphylococci, or pneumococci, and (more frequently than once believed) gonococci. The most frequent causes are acute rheumatic fever, diphtheria, pneumonia, cerebrospinal meningitis, scarlet fever, erysipelas, influenza, chorea, gonorrhea, sepsis and typhoid fever. It may also follow a follicular tonsillitis which

is rheumatic in type but has not caused arthritis. Tuberculosis may also occasionally cause an endocarditis.

This inflammation of the endocardium is generally confined to the region of the valves, and the valves most frequently so inflamed are the mitral and aortic. There may be a slight inflammation or actual ulceration and loss of tissue. Vegetations more or less constantly occur on the inflamed surfaces, with more or less danger of particles becoming loosened and moving free in the blood stream, causing embolic obstruction of different parts of the body. There is also more or less probability of serious adhesions or contractions occurring from the healing of the ulcerated surfaces. In other words, the future health and welfare of the valves depends on the fact that the inflammation has healed without contractions or adhesions.

It is often difficult to decide when acute endocarditis has developed, but with the knowledge that the endocardium often becomes inflamed during almost any of the acute infections, the physician should repeatedly examine the heart for murmurs, for muffled closure of the valves, or for other evidences of endocarditis or myocarditis during the acute infective process.

#### SYMPTOMS

Among the early symptoms of endocarditis, which is often not recognized until the appearance of a valvular lesion, may be pain or discomfort about the heart and a rise in temperature. Frequently also there may be some dyspnea. Patients so afflicted are usually nervous and restless, and inclined to show anxiety on even moderate exertion.

#### TREATMENT

In the treatment of mild acute endocarditis rest, both mental and physical, is of primary importance. This should extend over four to six weeks and should be absolute. To counteract muscular flabbiness, massage should be given, from simple rubbing and kneading to passive movements.

The medicinal treatment includes the use of alkalis. These may be given as potassium citrate in doses of 2 gm., every three to six hours, in wintergreen water. If the salicylates are being given, as they should be, to counteract rheumatic infection, sodium bicarbonate may be given in equal dosage. To counteract the anemia likely to develop, iron may be administered as 5 drops of the tincture of the chlorid in lemonade or orangeade, twice in twenty-four hours. A 3-grain tablet of saccharated oxid of iron may be given twice in twenty-four hours. Pain may be combated by the use of morphin in adults or codein if the patient be a child.

For marked nervousness and restlessness, the bromids may be of value; and in case of insomnia, chloral or sodium-ethyl-barbiturate may be used, a dosage of 3 to 5 grains being ordinarily sufficient.

*Diet.*—The diet should at first consist largely of milk and cereals with a moderate amount of fluid and alkaline drinks. During convalescence a full diet may be prescribed, especially milk, eggs and fresh vegetables. The bowels should be kept open but brisk catharsis is inadvisable. It is better to regulate the bowels by simple measures, such as proper foods, etc.

The correct use of cardiac drugs is a difficult problem. If there is myocardiac inflammation digitalis is inadvisable, as is the case in the presence of much endocardial inflammation. If there are signs of failure of the cardiac muscle, camphor or strophanthin have been advised when prompt stimulation is needed.

For hyperpyrexia and profuse perspiration, the surface of the body should be sponged with lukewarm or warm water. Too profuse sweating may be combated with atropin.

### **Malignant (Ulcerative) Endocarditis**

Ulcerative endocarditis may develop from the mild type or independently of it. It is essentially a septic process and develops from a local focus of infection elsewhere in the body. The process may include disintegration of the heart muscle and deep points of erosion as well as little pockets of pus or abscesses in the muscle tissue.



The diagnosis is not so difficult if this condition develops on a mild endocarditis as when it appears primarily. The temperature is generally intermittent, accompanied by chills. There may be prostration and profuse sweats.

Meningeal symptoms—headaches, restlessness, delirium, stupor—are not uncommon and convulsions may occur. Enlargement of the spleen and congestion of the liver may be found. Albumin appears in the urine. Definite cardiac symptoms and cardiac weakness eventually dominate the picture. Ecchymotic spots may appear over the body. If emboli break off and are carried to different parts of the body they bring about symptoms of embolism in that part. If mycotic, they may set up a local focus of infection; if lodging in a terminal artery, gangrene of the part concerned takes place, necessitating amputation, or perhaps being itself the cause of death.

#### TREATMENT OF MALIGNANT ENDOCARDITIS

The treatment of malignant endocarditis includes treatment of the condition that caused it plus treatment of "mild" endocarditis, as previously described, with the meeting of all other indications as they occur. As in septic processes, the nutrition must be pushed to the full extent to which it can be tolerated by the patient, namely, small amounts of a nutritious, varied diet, given at three-hour intervals.

Whether milk or any other substance containing lime makes fibrin deposits on the ulcerative surfaces more likely or more profuse, and therefore emboli more likely to occur, is perhaps an undeterminable question. In instances in which hemorrhages so frequently occur, as they do in this form of endocarditis, calcium is theoretically of benefit. Quinin has not been shown to be of value, nor has salicylic acid, unless the cause is rheumatism. Alcohol has been used in large doses, as it has been so frequently used in all septic processes. If the patient is unable to take nourishment in any amount, small doses of alcohol may be of benefit. It is probably of no other value. It is doubtful whether ammonium carbonate tends to prevent fibrin deposits or clots in the heart, as so long supposed. In fact,

whenever the nutrition is low and the patient is likely to have cerebral irritation from acidosis, whenever the kidneys are affected, or whenever a disease may tend to cause irritation of the brain and convulsions, it is doubtful if ammonium carbonate or aromatic spirit of ammonia is ever indicated. Ammonium compounds have been shown to be a cause of cerebral irritation.

Malignant endocarditis may prove fatal in a few days, or may continue in a slow subacute process for weeks or even months.

### Chronic Endocarditis

It is not easy to determine when subacute endocarditis becomes chronic. The process manifests itself by a gradual sclerosis of the valves. It should be treated on the same principles as the acute type, depending largely on the supposed cause of the disease.

### CHRONIC VALVULAR DISEASE

As has been indicated, chronic valvular disease arises commonly as the result of acute or chronic endocarditis, the former from infections, the latter perhaps associated with syphilis, alcoholism, gout, focal infections, etc.

The valvular disease may narrow or constrict the opening, giving rise to so-called stenosis; or it may render the valves incapable of closing correctly—so-called insufficiency. Because of its increased work the heart muscle may hypertrophy. As long as this hypertrophy is adequate the heart continues its work satisfactorily and the valvular lesion is said to be compensated. When the muscle is degenerated it may be unable to accomplish its work and is said to fail, and symptoms of cardiac failure appear. As the heart chambers overfill and are emptied with difficulty, dilatation takes place.

### THE COMPENSATED HEART

As long as compensation is complete no medication or physical treatment is necessary. However, such a patient should so order his life as to throw no special strain on the taxed organ. Severe athletic efforts, rushing up and down stairs, prolonged tension,

extreme worry, are to be interdicted. Tobacco and alcohol, tea and coffee should not be taken. Ordinary diseases occurring in such patients should be treated with exceptional watchfulness of the circulation.

### Mitral Stenosis

Perhaps 60 per cent. of mitral stenosis, which occurs most commonly between the ages of ten and thirty, has its origin in rheumatic endocarditis. This lesion is a serious handicap in such diseases as pneumonia, pleurisy or bronchitis, in which there is congestion of the lungs.

Among the more important symptoms are a murmur, diastolic and perhaps presystolic, heard over the left ventricle and accentuated at the apex. Usually there is an accentuated pulmonary closure. The pulse is generally slow; dyspnea on exertion is common and an increase in mucus in the throat is not infrequent.

As weakening of the compensation occurs, the heart beat becomes irregular; there is venous congestion of the head and face, blueing of the lips and sometimes hemoptysis. These patients suffer more or less from cold extremities.

Besides the usual treatment for broken compensation in patients with this lesion, digitalis is of the greatest value, and the slowing of the heart by it, allowing the left ventricle to be more completely filled with the blood coming through the narrowed mitral opening during the diastole, is the object desired. This drug acts similarly on both the right and left ventricles, and though there is no real occasion for stimulation of the left ventricle, and it is the right ventricle that is in trouble, dilated and failing, still a greater force of left ventricle contraction helps the peripheral circulation. The action on the right ventricle contributes greatly to the relief of the patient by sending the blood through the lungs and into the left auricle more forcibly, and the left ventricle receives an increased amount of blood, the congestion in the lungs is relieved and the dyspnea improves. Perhaps there is no class of cardiac diseases in which more frequent striking relief can be obtained than in these cases of mitral stenosis.

If the congestion of the lungs is very great and death seems imminent from cardiac paralysis, if cyanosis is serious and bloody, frothy mucus is being expectorated, venesection and an intramuscular injection of aseptic ergot may be indicated. Digitalis should also be given, hypodermatically perhaps, but its action would be too late if it was not aided by other more quickly acting drugs, such as strophanthin, intravenously. The physician may often save life by such radical measures.

### Mitral Insufficiency: Mitral Regurgitation

This is the most frequent form of valvular disease of the heart, and is due to a shortening or thickening of the valves, or to some adhesion which does not permit the valves to close properly, and the blood consequently regurgitates from the left ventricle into the left auricle during the contraction of the ventricle. Such regurgitation may occur without valvular disease if for any reason the left ventricle becomes dilated sufficiently to cause the valve to become insufficient. Such a dilatation can generally be cured by rest and treatment. As with mitral stenosis, the most frequent causes are rheumatism and chorea, which are mostly due to mouth infection, with the occasional other causes as previously enumerated.

The characteristic murmur of this lesion is a systolic blow, accentuated at the apex, transmitted to the left of the thorax, generally heard in the back, near the lower end of the scapula, and transmitted upward over the precordia.

Of all cardiac lesions, this is the safest one to have. Sudden death is unusual, the compensation of the heart seems to be most readily maintained, and the patient is not so greatly endangered by overexertion or by inflammations in the lungs. As in mitral stenosis, any increase in blood pressure—whether the normal increase after the age of 40, any continued earlier high tension, or increase from occupation or exercise—is serious, as causing the left ventricle to act more strenuously, so that more blood is forced back into the left auricle, the lungs become congested, and the right ventricle, sooner or later, becomes incompetent.



When compensation fails with these patients, the first sign is pendent edema of the feet, ankles and legs; subsequently, if there is progressive failure of compensation, the usual symptoms occur.

The treatment is principally rest and digitalis, and the recovery of compensation is often almost phenomenal. Patients with this lesion are likely to be children and young adults, and the heart muscle readily responds as a rule to the treatment inaugurated. Later, in these patients, or if the lesion occurs in older patients, the return to compensation does not occur so readily. If the condition is developed from a myocarditis or from fatty degeneration of the heart, it may be impossible to cause the left ventricle to improve so much as to overcome this relative dilatation or relative insufficiency of the valve. If the dilatation of the left ventricle is due to some poisoning, such as nicotin, with proper treatment—stopping the use of tobacco, administration of digitalis, and rest—the heart muscle will generally recover and the valve again properly close.

#### **Aortic Stenosis: Aortic Obstruction**

Valvular disease at the aortic orifice is much less common than at the mitral orifice, and while stenosis or obstruction is less common from rheumatism or acute inflammatory endocarditis than is insufficiency of this valve, a narrowing or at least the clinical sign of narrowing, denoted by a systolic blow at the base of the heart over the aortic opening, is in arteriosclerosis and old age of frequent occurrence. If such narrowing occurs without aortic insufficiency at the age at which it usually occurs, it may not seriously affect the heart. It may follow acute endocarditis, but it most frequently follows chronic endocarditis or atheroma, in which the aortic valves become thickened and more or less rigid; this condition most frequently occurs in men.

Anything that tends to increase arterial tension, as tobacco, lead or hard work, or anything that tends to cause arterial disease, as alcohol or syphilis, is often the cause of this lesion.

At times the edges of the valves may grow together from ulcerative inflammation, and the lumen thus be diminished in size; or projecting vegetations may interfere with the opening of the valve and with the flow of blood. With such narrowing the left ventricle more or less rapidly hypertrophies, to overcome its increased work.

The murmur caused by this lesion is a systolic one, either accentuated in the second intercostal space at the right of the sternum, or perhaps heard loudest just to the left of the sternum in this region. The murmur is also transmitted up the arteries into the neck, and may at times be heard in the subclavian arteries. It may also be transmitted downward over the heart. The pulse is slow, the apex of the rise of the sphygmographic arterial tracing is more or less sustained and rounded, and the rise is much less than normal.

If this lesion occurs in old age, there is general arterial disease present and the tension and compressibility of the arteries vary, depending on how much they are hardened. The disturbed circulation is evidenced by imperfect peripheral circulation and capillary sluggishness, with at times pendent edema of the feet and ankles, but, perhaps, little congestion of the lungs. The left ventricle being sufficient, there is no damming back through the left auricle to the lungs. The left ventricle may, however, become weakened, either by some sudden strain or by a chronic myocarditis, and relative insufficiency of the mitral valve may occur. The subsequent symptoms are typically those of loss of compensation.

This lesion may allow a patient to live for years, provided no other serious disturbance of the heart occurs, such as myocarditis or coronary disease; but sooner or later, with the failing force of the blood-flow and the lessened aortic pressure, slight attacks of anemia of the brain occur, causing syncope or fainting. Also, sooner or later these patients have little cardiac pains. They begin to "sense" their hearts. There may not be actual anginas, but a little feeling of discomfort, with perhaps pains shooting up into the neck, or a feeling of pressure under the sternum.

Little excitements or overexertions are likely to make the heart attempt to contract more rapidly than it is able to drive the blood through the narrow orifice, and this alone causes cardiac discomfort and the feeling of cardiac oppression.

It is essential, then, that these patients should not hasten and should not become excited; and any drug or stimulant that would cause cardiac excitement is bad for them. Nitroglycerin will do good work in these cases, and with high blood tension may be the only safe drug for the patient to have on hand. As soon as his attack occurs, with or without real angina pectoris, let him dissolve in his mouth a nitroglycerin tablet. If he feels faint, he will feel better the moment he lies down, and in this instance he may be improved by a cup of coffee, or a dose of caffeine, camphor or ammonia.

If the left ventricle becomes still weaker and shows signs of serious weakness, or if there is actual dilatation, the question of whether or not digitalis should be used is a subject for careful decision. The left ventricle should not be forced to act too sturdily against this aortic resistance. Consequently the dose of digitalis must be small. On the other hand, it frequently happens, especially in old age, that myocarditis or fatty degeneration has already occurred before this cardiac weakness develops in the presence of aortic narrowing, and digitalis may not be indicated at all. We cannot tell how far degeneration may have gone, however, and small doses of digitalis used tentatively and carefully, perhaps two or three drops of an active tincture, two or three times a day, and then the drug carefully increased to a little larger dose to see whether improvement takes place, is the only way to ascertain whether digitalis can be used with advantage, or not. If it increases the cardiac pain and distress, it should not be used. Strychnin is then the drug that should be relied on, with such other general medication as is needed, combined with the coincident administration of nitroglycerin, which may also be given in conjunction with digitalis, if deemed advisable. Generally, however, if a heart with aortic stenosis needs stimulation the blood pressure is

generally none too high, although there may be arteriosclerosis present. Therefore when nitroglycerin is indicated to lower blood pressure, digitalis is not usually indicated; when digitalis is indicated to aid the heart, nitroglycerin is generally not indicated. These patients must have high blood pressure to sustain perfect circulation at the base of the brain.

Patients who have this lesion should not use tobacco in large amounts, or sometimes even in small amounts, as tobacco raises the blood pressure and thus puts more work on the left ventricle; in the second place, if the left ventricle is failing, much tobacco may hasten its debility. On the other hand, with a failing left ventricle and a long previous use of tobacco it is no time to prohibit its use absolutely. A failing heart and the sudden stoppage of tobacco may prove a serious combination.

#### **Aortic Insufficiency: Aortic Regurgitation**

This lesion, though not so common as the mitral lesion, is of not infrequent occurrence in children and young adults as a sequence of acute rheumatic endocarditis. If it occurs later in life it generally is associated with aortic narrowing, and is a part of the general endarteritis and perhaps atheroma of the aortic. Sometimes it is caused by strenuous exertion apparently rupturing the valve.

This form of valvular disease frequently ends in sudden death. On the other hand, it is astonishing how active a person may be with this really terrible cardiac defect. This lesion, from the frequent overdistention of the left ventricle, is one that often causes pain. While the left ventricle enlarges enormously to overcome the extra distention due to the blood entering the ventricle from both directions, the muscle sooner or later becomes degenerated, from poor coronary circulation. Unless the left ventricle can do its work well enough to maintain an adequate pressure of blood in the aorta, the coronary circulation is insufficient, and chronic myocarditis is the result. If the left ventricle has maintained this pressure for a long time, edemas are not common unless the cardiac weakness is serious and generally permanently serious; that is, slight weakness, in this lesion, does not give edemas



as does slight loss of compensation in mitral disease, and unless the weakness of the ventricle is serious the lungs are not much affected.

The physical sign of this lesion is the diastolic murmur, which is loudest at the base of the heart, is accentuated over the aortic orifice, and is transmitted up into the neck and the subclavians, and down over the heart and down the sternum with marked pulsations of the arteries (Corrigan pulse) and often of some of the peripheral veins, notably of the arms and throat.

If the left ventricle becomes dilated the mitral valve may become insufficient, when the usual lung symptoms occur, with hypertrophy of the right ventricle; and if it fails, the usual venous symptoms of loss of compensation follow. This lesion not infrequently causes epistaxis, hemoptysis and hematemesis.

Digitalis is always of value in these cases, but it should not be pushed. If a heart is slowed too much the regurgitation into the left ventricle is increased. Therefore such hearts should not be slowed to less than eighty beats per minute, or sudden anemia of the brain and sudden death may occur. These patients must not do hard work.

### Tricuspid Insufficiency

This rarely, if ever, occurs alone; it is generally a sequence of other valvular defects, and represents an overworked, dilated right ventricle. It may, however, occur from lesions of the lungs which impede the blood-flow through them. Such are fibroid changes in the lungs, emphysema, prolonged chronic bronchitis, the last stages of pulmonary tuberculosis, old neglected pleurisies with cirrhosis or fibrosis of the lungs, and repeated attacks of asthma—anything, whether valvular defect or pulmonary circulatory disturbance, that increases the pressure ahead and the work of this ventricle.

The symptoms are those of loss of compensation, as described under other valvular lesions. There may be jugular pulsation, especially evident in the external jugular on the left side. The liver enlarges and may pulsate. There are edemas, dropsies, ascites and per-

haps hemorrhages. The heart is enlarged and there is a soft systolic blow heard at the lower end of the sternum. The dyspnea is sometimes very great, and cyanosis may be present, especially during paroxysms of coughing.

This lesion of the heart is always benefited by digitalis, but the continuance of the improvement and its amount depend, of course, on the cause of the dilatation of the ventricle. Strychnin is often of advantage. These patients should rarely receive vasodilators, and hot baths, overheating, overloading the stomach and vigorous purging should never be allowed. Sometimes improvement will not take place until ascitic or pleuritic fluid, if present, has been removed.

#### **Tricuspid Stenosis: Tricuspid Obstruction**

This is rare and probably always congenital, and is supposed to be due to an inflammation of the endocardium during intra-uterine life. In early childhood it is possible that it may be associated with left-side endocarditis.

A special treatment of the heart would not be indicated unless there is associated tricuspid insufficiency, when digitalis might be used.

#### **Pulmonary Insufficiency: Pulmonary Regurgitation**

If this rare condition occurs, it is probably congenital. A distinctive murmur of this insufficiency would be diastolic and accentuated in the second intercostal space on the left of the sternum. It should be remembered that aortic murmurs are often more plainly heard at the left of the sternum. Sooner or later, if this lesion is actually present, the right ventricle dilates and cyanosis and dyspnea occur. Digitalis would then be indicated.

#### **Pulmonary Stenosis: Pulmonary Obstruction**

If stenosis is actually present in this location, the lesion is probably congenital. It might occur after a serious acute infectious endocarditis, but then it would be associated with other lesions of the heart. It has been found to be associated with such congenital lesions of the heart as an open foramen ovale or foramen Botalli, or with an imperfect ventricular septum,

and perhaps with tricuspid stenosis—in short, a cardiac congenital defect. The right ventricle becomes hypertrophied, if the child lives to overcome the obstruction.

The physical sign is a systolic blow at the second intercostal space on the left; but, as just stated, such a murmur must surely be dissociated from an aortic murmur if found to develop after babyhood, and it should also be diagnosed from the frequently occurring hemic, basic systolic murmurs; that is, if signs of pulmonary lesions are not heard soon after birth or in early babyhood, the diagnosis of pulmonary defects can be made only by exclusion.

Unless the right ventricle is found later to be in trouble, there is no treatment for this condition. If the right ventricle dilates, digitalis may be of benefit.

### ACUTE HEART ATTACK

The patient with valvular disease may suddenly be seized with an acute attack of agony in the heart region, dyspnea, and a feeling of oppression. A patient in this condition may die at any moment.

The immediate conditions to be met are the rapid fluttering heart, the nervous excitation and the vasomotor spasm, as well as the cardiac anxiety. Two factors of great importance are the establishment of self-control and confidence by the patient and the spontaneous relaxation following exhaustion. The part played by the nervous system in such attacks is shown by the good effects which may follow a hypodermic injection of morphin sulphate. It quiets the nervous system, causes drowsiness, relaxes spasm, and thus causes increased peripheral circulation. While morphin is indicated, a very large dose should not be given lest the activity of the respiratory center be greatly impaired. The addition of atropin to the morphin may prevent the depression and sometimes of itself quiets cardiac pain. It may, however, irritate the heart and will increase vasomotor tension. The patient should be put to bed and recline on several pillows. For quick momentary stimulation smelling salts of ammonia may be used. If available give one half a teaspoonful of aromatic spirits of ammonia in twice the amount of water. Strychnin sulphate, 0.002

gm., or 1/30 grain, may be given hypodermically as a stimulant to the central nervous system and to the cardiac nerves. Hot coffee may be given by the mouth. If available an injection of the contents of an ampule of camphor in oil may be injected intramuscularly. Epinephrin may be given in a dose of 5 drops on the tongue, and may be repeated in half an hour if advisable. It is understood that these are merely suggested as alternative methods of treatment. The response of the patient should be carefully noted.

If the patient collapses, with marked dyspnea, subnormal blood pressure, cyanosis, feeble pulse, etc., and does not have the tension of fear, the treatment should be somewhat different. Aseptic ergot may be injected at once intramuscularly. If the patient has not been overpowered with digitalis it may be advisable to administer some form of this drug to obtain the future continued action.

Strophanthin may be given intravenously and in this way is a quickly acting stimulant. The dosage should be from 1/500 to 1/200 grain. It should not be given if the patient has received much digitalis.

If the emergency is excessively urgent, the lungs filled up with blood, moist rales beginning to occur, and frothy and blood-tinged sputum being coughed up, venesection may be done. If there is extreme air hunger the administration of oxygen as described by Meltzer aids to satisfy this need.

Alcohol is absolutely contraindicated in these cases.

### BROKEN COMPENSATION

Rest in bed, in a bedroom that is attractive, with fresh air and sunlight, is of great importance. In patients over 50 it may be a question as to whether some exercise should not be advised. The patient should be individualized and proper measures taken to give mental and physical rest, to prevent excitement, and at the same time to prevent mental depression.

### DIET

The diet should be adequate; not profuse, not deficient. Large quantities of fluids cause discomfort. The diet should be sufficiently varied to encourage



appetite. In case there is dropsy or any accumulation of fluid, the intake of fluids may be greatly restricted and only a moderate quantity of salt should be included in the diet.

#### ELIMINATION

The eliminative organs should usually be encouraged but this should not be drastic. Hot sponge baths and warm alcohol rubs may be given, accompanied by gentle massage. Diuretics generally act unsatisfactorily in cardiac conditions. If the secretion of urine suddenly becomes small in amount, the diet should be quickly reduced and the elimination through the skin watchfully encouraged. The bowels should move satisfactorily daily. Active watery purgings are rarely advisable and simple vegetable laxatives are usually sufficient.

#### TREATMENT WITH CARDIAC DRUGS

Digitalis, or some of its preparations, is the drug of chief reliance in this condition, dependent, of course, on the amount of good heart muscle available for it to act on. It is advisable to use a tincture of known character beginning with a moderate dose, perhaps 10 drops every eight hours, and increasing a few days later to 15 drops once in twelve hours and later to 20 drops once a day. The action in large doses is cumulative and with large doses the drug should not be continued longer than five or six days without intermission. A number of special preparations of digitalis are described in New and Nonofficial Remedies. Digitalis or its preparations should not be used when there is a fatty degeneration of the heart; it should ordinarily not be used if there is arteriosclerosis or coronary disease. The signs of overaction of digitalis are nausea, vomiting, a diminished amount of urine, occipital headache, and coldness of the hands and feet. The pulse may be reduced to sixty or less a minute.

In such instances the drug should be stopped immediately, saline laxatives may be given, hot sponge baths and perhaps alcohol or nitroglycerin.

Strophanthus is a drug of little value in restoring compensation, but strophanthin intravenously or sub-

cutaneously acts quickly, stimulating the heart and contracting the blood vessels.

Caffein, given as coffee or citrated caffein,  $1\frac{1}{2}$  grains two or three times early in the day, acts as a stimulant to the heart, increasing its activity. It is contraindicated in the presence of good compensation. It is a cerebral stimulant. Strychnin promotes all muscular activity and is a general nervous stimulant. It may be indicated when the heart is acting sluggishly.

#### CONVALESCENCE

When compensation has been restored, the patient may be allowed gradually to resume his usual habits and work, provided that these habits are sensible, and that the work is not one requiring severe muscular exertion. Careful rules and regulations must be laid down for him, depending on his age and the condition of his arteries, kidneys and heart muscle. It should be remembered that a patient over 40, who has had broken compensation, is always in more danger of a recurrence of this dilatation of the heart than one who is younger, as after 40 the blood pressure normally increases in all persons, and this normal increase may be just too much for a compensating heart which is overcoming all of the handicap that it can withstand. Such patients, then, should be more carefully restricted in their habits of life, and also should have longer and more frequent periods of rest.

The avoidance of all sudden exertion in any instance in which compensation has just been restored is too important not to be frequently repeated. The child must be prevented from hard playing, even running with other children, to say nothing of bicycle riding, tennis playing, baseball, football, rowing, etc. The older boy and girl may need to be restricted in their athletic pleasures, and dancing should often be prohibited. Young adults may generally, little by little, assume most of their ordinary habits of life; but carrying heavy weights up-stairs, going up more than one flight of stairs rapidly, hastening or running on the street for any purpose, and exertion, especially after eating a large meal, must all be prohibited. Graded physical exercise or athletic work, however, is

essential for the patient's future health: at first walking and later more energetic exercise may be advisable.

These patients must not become chilled, as they are likely to catch cold, and a cold with them must not be neglected, as coughing or lung congestions are always more serious in valvular disease. Their feet and hands, which are often cold, should be properly clothed to keep them warm. Chilling of the extremities drives the blood to the interior of the body, increases congestion there, and by peripheral contraction raises the general blood pressure. A weak heart generally needs the blood pressure strengthened, but a compensating heart rarely needs an increase in peripheral blood pressure, and any great increase from any reason is a disadvantage to such a heart. The patient should sleep in a well-ventilated room, but should not suffer the severe exposures that are advocated for pulmonary tuberculosis, as severe chilling of the body must be absolutely avoided.

The peripheral circulation is improved, the skin is kept healthy, the general circulation is equalized, and the heart is relieved by a proper frequency of warm baths. Cold baths are generally inadvisable, whether the plunge, shower or sponging; very hot baths are inadvisable, on account of causing faintness; while warm baths are not stimulating and are sedative. The Turkish and Russian baths should be prohibited; they are never advisable in cardiac disease. With kidney insufficiency, body hot-air treatment (body-baking), carefully supervised, may greatly benefit a patient who has no dilatation of the heart and who has no serious broken compensation. Surf-bathing and, generally, sea-bathing and lake-bathing are not advisable. The artificial sea-salt baths and carbon dioxid baths may do some good, but they do not lower the general blood pressure so surely as has been claimed, and probably no great advantage is derived from such baths. If a patient cannot properly exercise, massage should be given him intermittently.

Any systemic need should be supplied. If the patient is anemic, he should receive iron. If he has no appetite, it should be encouraged by bitter tonics. If sleep does not come naturally, it must be induced by such means as do not injure the heart.

### ANGINA PECTORIS

Angina pectoris is a name applied to the condition manifested by pain in the heart region, due to the heart itself.

#### SYMPTOMS

The pain of the true angina pectoris generally starts in the region of the heart, radiates up around the left chest, into the shoulder, and often down the left arm. Such a patient is likely to assume a characteristic posture. He stops still wherever he is, stands perfectly erect or bends his body backward, raises his chin, supports himself with one hand and places the other over the heart. The duration of the attack is usually but a few seconds, but the patient may die in the first or in any subsequent attack. The pulse may become very slow. Profuse sweating, restlessness and dyspnea may accompany an attack. The pain may be felt especially in the upper part of the sternum over the aorta.

#### IMMEDIATE TREATMENT

For treatment of the immediate pain, anything may be given that quickly relieves local or general arterial spasm and spasm of the muscles. The moment that the heart and its arterioles relax, the attack is often over. The most quickly acting drug for this purpose is amyl nitrite, inhaled. If amyl nitrite is not at hand, or has been found previously to cause considerable disturbance of the head or a feeling of prolonged faintness, nitroglycerin is the next most rapidly acting drug. It may be given hypodermatically, or a tablet may be dissolved under the tongue. The amyl nitrite should be in the emergency case of every physician, in the form of ampules, or may be carried by the patient after he has had one attack. The ampules now come made of very thin glass with an absorbent and silk covering ready for crushing with the fingers, and are thus immediately ready for inhalation. One of these is generally all that it is necessary to use at any one time. Nitroglycerin may be given hypodermatically in a dose of 1/100 grain. If given by mouth the dose should be the same, repeated in ten minutes if the pain has not stopped.



Almost coincidently with the administration of nitroglycerin or the amyl nitrite a hypodermatic injection of  $\frac{1}{8}$  or  $\frac{1}{6}$  grain of morphin sulphate should be given without atropin, as full relaxation is desired without any stimulation of atropin.

If the patient is at home and at rest at the time of an attack, a hot-water bag but slightly filled, or a pad electrically heated may be placed over the heart, sometimes with marked advantage and relief from pain. Occasionally even such gentle applications are not tolerated.

After the attack is over absolute rest for some hours, at least, is positively necessary. If the attack was severe, the patient should rest several days, as there seems to be a great tendency for such attacks to come in groups, the cause being acutely present for at least some time. But little food should be given; nothing very hot or very cold, and no large amount of liquids; gentle catharsis may be induced on the following day, if deemed advisable; no stimulating drugs should be administered, and nothing that would raise the blood pressure.

The question often arises as to whether the patient shall be told of the consequences of his condition. It is hardly wise to withhold this knowledge from him, and generally it is not necessary. The ordinary alert patient knows how serious the condition is by his own feelings, and will even reprove or joke with his physician for minimizing the danger. It is best that the whole subject be discussed carefully with him and his life regulated and ordered, and emergency drugs prepared and given him with proper instructions to the family, so that he may possibly prevent other attacks, and, if they occur, may have the best immediate treatment.

#### PREVENTION

To prevent the attacks it is of first importance that the patient live a regular life, and avoid overexertion, mental excitement, chilling of the body and anything else that seems to bring on the pains. Moderation in the diet, especially in the obese, should be the rule. Rest and diversion with graduated exercises are the greatest factors in the beneficial results of baths of

the type given at Nauheim and other institutions. Essentially the same baths may be given at home by adding 9 pounds of sea-salt and 10 ounces of commercial calcium chlorid to 40 gallons of water, with or without carbonic acid gas.

The acute symptoms being over, a careful analysis of the probable cause of the anginal attack should be made. If there is a general sclerosis, the treatment should be directed to that condition. If there is a myocarditis or a fatty heart, this should be treated as previously described. If there is a toxemia from intestinal disturbance, that may readily be remedied. If the cause is nicotin, it need not again occur from that reason, and perhaps the damage caused by the nicotin may be removed. Any organic kidney trouble must, of course, be managed according to its seriousness; and, if there is hypertension, treatment should be directed toward its relief. And especially inquiry should be made as to the possibility of syphilis being a factor.

### AURICULAR FIBRILLATION

While auricular fibrillation is a clinical entity, it is often difficult of diagnosis, and sometimes can be excluded only by treatment and the results of treatment, or by watching the patient for some time. When completely present, it consists really of a paralysis of the auricles; normal systolic contractions of the auricles do not occur, although there are little rapid twitchings of different muscle fibers of the auricles, which give the name to the condition.

The irregular pulse in auricular fibrillation is more or less distinctive, being generally rapid, from 110 upward. Occasionally the pulse-rate may be much slower, if the heart is under the influence of digitalis. The irregularity of the pulse in this condition is excessive; the rate, strength and apparent intermittency during a half minute may not at all represent the condition in the next half minute, or in the next several minutes. It has been thought that auricular fibrillation, while prevented many times by digitalis, is perhaps incurable. This is probably not true in the early stages of the condition. If digitalis does not

cure the irregularity, the condition has been termed the "absolutely irregular heart." Other terms applied to the condition have been "ventricular rhythm," "nodal rhythm" and "rhythm of auricular paralysis." The condition of the pulse has been Latinized as *pulsus irregularis perpetuus*.

While the condition is best diagnosed by tracings taken simultaneously of the heart, jugular and radial, still the jugular tracing is almost conclusive in the absence of the auricular systolic wave. The radial tracing is exceedingly suggestive, and if it is taken with a careful stethoscoping of the heart, an almost certain presumptive diagnosis may be made.

#### OCCURRENCE

This condition of auricular fibrillation occurs occasionally in valvular disease, and perhaps most frequently in mitral stenosis; but it can occur without valvular lesions, and with any valvular lesion. If it occurs in younger patients, valvular disease is likely to be a cause; if in older patients, sclerosis or myocardial degeneration is generally present.

It may also follow depressing infections, such as diphtheria, or some infection that has caused a myocarditis. Rarely this fibrillation may be caused by some of the drugs used to stimulate the heart.

It is astonishing how few symptoms may be present in auricular fibrillation and with an absolutely irregular heart action. The patient may be able to perform all of his duties, however strenuous, until coincident, concomitant or causative ventricular weakening and dilatation or broken compensation occurs, and then the symptoms are those due to the cardiac failure. Often in the first stage of this weakening and later fibrillation of the auricles the patient may recognize the cardiac irregularity and disturbances. Generally, however, he soon becomes accustomed to the sensations, and, unless he has cardiac pains or dyspnea, he becomes oblivious to the irregularity. At other times he may be conscious of irregular, strong throbs or pulsations of the heart, as such hearts often give an occasional extra sturdy ventricular contraction. These he notes. Real attacks of tachycardia may be

superimposed on the condition. Sooner or later, however, if the condition is not stopped, cardiac weakness and loss of compensation, with all the usual symptoms, occur. It seems to be probable that more than half of all cases of heart failure are due to auricular fibrillation, or at least are aggravated by it.

#### TREATMENT

The condition may be stopped by relieving the heart and circulation of all possible toxins and irritants, and by the administration of digitalis. One attack is frequently followed by others, perhaps of longer duration. Occasionally, however, the patient may be observed for many years without the condition again occurring. If the pulse, in spite of treatment, is permanently irregular, and auricular insufficiency is permanent, the patient is of course in danger of cardiac failure; but still he may live for years and die of some other cause than heart failure. The prognosis seems to be better when the pulse is not rapid—below a hundred. This shows that the ventricles are not much excited and do not tend to wear themselves out.

Any treatment that lowers the heart-rate is of advantage, such as the stopping of tea and coffee, the administration of digitalis, and an increased amount of rest and quiet. Digitalis should be increased gradually until a fair dose is given, and it is better to administer one dose a day than several. If it causes undesired symptoms, such as cardiac pain, a tight feeling in the chest, nausea or vomiting, or a diminished amount of urine, it is not acting well and should be stopped. If the pulse is gradually slowed to about what is normal, its action should be considered successful.

If the pulse is intermittent and there is apparently a heart-block, Stokes-Adams disease should be considered as possibly present, and digitalis would be contraindicated and would do harm.

A scientific indication as to whether a heart is disturbed through the action of the vagi nerves or whether the disturbance is due to muscle degeneration may be obtained by the administration of atropin. Talley (*Amer. Jour. Med. Sci.*, Oct., 1912) of Philadelphia shows the diagnostic value of this drug. It is a familiar



physiologic fact that stimulation of the vagi slows the heart or even stops it. Stimulation of these nerves by the electric current, however, does not destroy the irritability of the heart; indeed, the heart may act by local stimulation after it has been stopped by pneumogastric stimulation. It is also a well known fact that anything that inhibits or removes vagus control of the heart allows the heart to become more rapid, since these nerves act as a governor on the heart's contraction. Under the influence of atropin the heart-rate is increased by paralysis of the vagi. Talley states that a hypodermic injection of from  $1/50$  to  $1/25$  grain of atropin produces the same paralytic and rapid heart effect in man. He advises the use of  $1/25$  grain of atropin in robust males, and  $1/50$  grain in females and in less robust males, and he has seen no serious trouble occur from such injections. The throat is, of course, dry and the eyesight interfered with for a day or more, but Talley has not seen even insomnia occur, to say nothing of nervous excitation or delirium. Theoretically, however, before such atropin dosage, a possible idiosyncrasy against belladonna should be determined.

The value of this test rests on the fact that atropin thus injected will increase the normal heart from thirty to forty beats a minute, and Talley believes that if the heart-beat is increased only, twenty or less, if the patient has not been suffering from an exhausting disease, it shows "a degenerative process in the cardiac tissue, which makes the outlook for improvement under treatment unpromising." He also believes that when the heart-beat in auricular fibrillation is increased the normal amount or more than normal, the prognosis is good. He still further advises in auricular fibrillation an injection of atropin before digitalis has been administered, and another after digitalis is thoroughly acting. Comparison of the findings after these two injections will determine which factor, vagal or cardiac tissue, is the greater in the condition present. The patients with a large cardiac factor are the ones who may be more improved by the digitalis treatment than those in whom the fibrillation is caused by vagus disturbance.

### HEART BLOCK

Complete heart block is due to pathologic changes affecting the system of fibers whose function it is to convey from the auricles the stimulus which causes normal ventricular contraction. Gummas, calcified plaques, or tumors may press on or invade that part of the auriculoventricular conducting system known as the bundle of His. Fibrosis, fatty degeneration, infarcts and inflammatory changes occurring in the bundle of His and perhaps other portions of the conducting system, may also produce heart block. Incomplete heart block, in which the relation of auricular to ventricular rhythm is partially retained, may be due to less extensive changes in the auriculoventricular system, resulting from acute infections such as pneumonia, diphtheria, rheumatism, typhoid fever or sepsis; from lesions of the medulla oblongata or vagus, and from overdosage with digitalis. It is probable that many deaths in acute infections are due to some form of heart block, and are caused by inflammatory swelling of the fibers of the auriculoventricular system.

Patients with heart block may present no symptoms except slow pulse and independent rhythm of auricles and ventricles. This difference in rhythm is determined by comparing the number of pulsations of the jugular veins per minute as observed in the neck, with the radial pulse or the ventricular beat as made out at the heart. Syncopal attacks, completing the picture of the Adams-Stokes syndrome, may occur at the onset of complete heart block or at any time after this condition has become established.

If during a syncopal attack, the ventricles remain inactive for from fifteen to twenty seconds, muscular twitchings simulating an epileptiform seizure occur. If the ventricles are inactive for much longer than twenty seconds, death results. In some cases of complete heart block in which the ventricles beat with their own slow rhythm, independently of the auricles, the syncopal attacks may be absent for many years.

### TREATMENT

Antisymphilitic treatment will greatly improve or cure those cases of heart block which are syphilitic in

origin, in which the conducting system has not been completely destroyed. A Wassermann test should, therefore, always be made. In cases due to other causes, drug treatment offers relatively little help. Digitalis, since it tends to slow still further the ventricular rate, should be withheld except in cases of long standing which have become decompensated owing to myocardial disease. Atropin may be used in the attack, but many who have given special study to the action of drugs in these cases question its value. Rest is important especially in the cases occurring during acute infections.

# DISTURBANCES OF THE BLOOD AND BLOOD-MAKING ORGANS

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## ANEMIA

In the conditions characterized by a reduction of the oxidizing power of the blood we distinguish two principal varieties. In one of these the corpuscles are only moderately affected, but are less efficient oxidizing agents because they contain a deficient amount of hemoglobin. The number of red cells is only moderately reduced, but the functional power of each cell is far below the normal. The blood when examined by laboratory methods is found to have a low color index. To determine this it is necessary to estimate the number of red corpuscles in a cubic millimeter. This figure is then compared with 5,000,000, the average number of red corpuscles in a cubic millimeter of blood of a normal person, the result representing the percentage of corpuscles. This percentage is made the denominator and the percentage of hemoglobin the numerator, and the resulting fraction is the color index.

In chlorosis and secondary anemias the color index is low; in pernicious anemia the color index is high, although the total amount of hemoglobin is much reduced. In pernicious anemia many corpuscles have been destroyed but the individual corpuscle carries more than the average charge of hemoglobin. Having fixed the type of anemia, it is necessary to search for any etiologic factor which may favor the reduction of the corpuscles or make them poor in hemoglobin. Any loss of blood if often repeated or habitual is likely to lead to anemia or may so act on the blood-making organs as to transform the type of the disease into the pernicious form. Care should be taken to exclude wasting of cachectic diseases, which frequently lead to secondary anemias which may be incurable, until the primary affection is removed. Intestinal worms, particularly hookworm and tapeworm, frequently cause anemia, partly by the repeated drawing of blood and



partly by the toxins produced by the worm and absorbed into the bloodstream. Other poisons, either extraneous or autogenous, may produce a like effect, especially the products of mouth infection.

### TREATMENT

The first step in treatment after removing any discoverable cause is to place the patient under the best hygienic conditions and afford as nourishing a diet as possible.

In combating the anemia, of greatest importance is the improvement of the hygienic condition of the patient, by fresh air, sunlight, and moderate exercise.

### DIET

The chief point as regards diet is the necessity of increasing the amount of meat, which contains two to eight times more iron than such foods as rice and other farinaceous foods. The following table gives the percentages of iron in various food substances:

100 Gm.	Contains Mg. of Iron
Rice .....	1.8
Rye .....	4.9
Wheat .....	5.3
Oats .....	13.1
Corn .....	3.6
Potatoes .....	4.2
Peas .....	6.6
Beans .....	7.5
Apples .....	13.2
Strawberries .....	8.9
Cabbage .....	3.9
Spinach .....	35.9
Milk .....	2.3
Beef .....	4.8-16.6
Eggs .....	5.7
Fish .....	1.5-84.2
Veal .....	2.7

The diet should therefore contain much animal food, beef, mutton or chicken, etc. Food may be taken in smaller amount and at more frequent intervals.

There can be no question of the advantages of fresh air and sunlight to patients suffering from anemia, and there could be no better treatment than the open-air sanatorium treatment advocated for tuberculosis for these anemic patients. Patients improve with iron, and they will improve as much with an inorganic iron as with any organic iron. The mistake has been that too much iron is administered, hence some peptonate or albuminate or other organic iron has been said to be better tolerated. The mistake has been that the dose of the inorganic iron was not small enough; very little is needed to satisfy the economy for iron. The tincture of the chlorid of iron, or the reduced iron in tablet or capsule, or the pill of the carbonate of iron (Blaud), or the saccharated oxid of iron present a variety of inorganic irons sufficient to meet any indication; the multitude of other iron preparations is not needed and is superfluous. Moreover, as iron is used in chronic conditions over a long period of time, it is irrational to give it intravenously.

#### DETAILS OF TREATMENT IN CHLOROSIS

In chlorosis, so generally accompanied as it is with amenorrhea, thyroid substance may be given in small doses, as:

	Gm.
R Thyroidei sicci .....	3  or gr.xlv
M. et fac capsulas 20 (dry).	
Sig.: One capsule, three times a day, after meals.	

Or:

	Gm.
R Thyroidei sicci .....	2
Ferri reducti.....	2  or āā gr.xxx
M. et fac capsulas 20 (dry).	
Sig.: One capsule, three times a day, after meals.	

Occasionally cases of chlorosis resist iron and improve only after they have been kept in bed for a number of weeks. In some of these recovery is hastened by arsenic.

In convalescence from chlorosis iron should be continued in small doses for from three to six months.

Iron may be given as follows:

	Gm.	
R Tincture ferri chloridi.....	5	fl̄ 3 iss
Syrupi acidi citrici.....	25	or fl̄ 3 i
Aquae .....	ad 100	ad fl̄ 3 iv

M. Sig.: A teaspoonful, in water, three times a day, after meals.

Or:

	Gm.	
R Ferri reducti.....	2	or gr. xxx

M. et fac capsulas 20 (dry).

Sig.: One capsule, three times a day, after meals.

Or:

R Pilulas ferri carbonatis. (Blaud) No. 20.

Sig.: One pill, three times a day, after meals.

## PERNICIOUS ANEMIA

Several conditions have been included under this name, but the most frequent cause is probably focal infection. It should include cases with the following symptomatology: It is commonest in people of middle age; the well to do are affected almost as often as the poor; men and women are affected in approximately equal numbers; the onset is, as a rule, insidious, the patients complaining of weakness without apparent cause, of increasing pallor (with straw-colored tint to the skin); of dyspnea, of gastro-intestinal disturbances, and of nervous symptoms; the urine is usually highly colored and contains a high amount of urobilin; there is always gastric anacidity, and the blood changes characteristic of a hemolytic anemia are demonstrable (reduced red count; anisocytosis; poikilocytosis; high color index; often regeneration signs, including nucleated red cells, polychromatic red cells and basophilic stippling; moderate leukopenia with relative lymphocyte increase, and a diminished number of platelets). There is often a little fever but not always. Numbness in the hands and feet are not uncommon; in the later stages the anesthetics, paralyses or ataxias due to lesions in the spinal cord may be encountered.

The primary treatment is to seek and remove focal infection, frequently in the mouth. The treatment of

pernicious anemia in general must be conducted on the same principles as govern simple anemia, except that it is generally recognized that iron is practically useless in this form of the disease. There is no deficiency in iron in pernicious anemia, but with repeated courses of arsenic it is possible sometimes to keep patients in good condition for years, even sometimes retaining their earning capacity. The patient should be kept under constant supervision, so that the arsenic can be promptly resumed at the first signs of a relapse; iron may then prove useful also when the arsenic fails. In pernicious anemia, hydrochloric acid and pepsin must be given persistently.

#### SPLENECTOMY

For some time it was believed that splenectomy, which was frequently followed by immediate improvement, was a measure of much promise in this disease. The present belief is that the results achieved do not warrant the use of this radical measure.

#### ARSENIC

In giving arsenic for this disease Cabot advises to begin with a dose of two minims of Fowler's solution (liquor potassii arsenitis), well diluted, three times a day, after meals, and gradually increase until the patient is taking 15 minims three times daily. The drug may be given in soluble tablet form, commencing with .002 gm. (1/30 grain) and increasing according to the patient's tolerance. When symptoms of intolerance appear the medicine should be suspended until the symptoms disappear when the treatment should be resumed. In Cabot's experience atoxyl, sodium cacodylate, and similar preparations present no advantage over the ordinary forms of arsenic.

#### BLOOD TRANSFUSION

Blood transfusion has been given an extended trial in this condition, but also without permanent cures.

Anders (*Amer. Jour. Med. Sci.*, 158:659, 1919) maintains that blood transfusion offers more for this disease than any other form of treatment. More than



half of some 450 cases treated by this method showed an initiation of remissions. Repeated small transfusions of from 200 to 500 c.c. of blood gave more satisfactory results than single massive ones.

#### GENERAL TREATMENT

The general treatment of this condition includes dietetic and hygienic measures, pharmacotherapy, combating of focal, gastric and intestinal sepsis.

Barker and Sprunt describe the regimen for these patients as conducted by them in the Johns Hopkins Hospital. A diagnostic study of the patient is made. He is placed in bed in a private room and given absolute rest. After the history has been carefully investigated and the usual complete examination of the blood and the secretions made, a thorough search is made for possible focal infection. The mouth, nose and throat, sinuses, digestive tract and urogenital tract are carefully investigated by specialists. If any focal infection is found it should be thoroughly eradicated.

The dietetic treatment is elaborate. In the severer cases they begin with the milk diet of Dubois. On the first day  $2\frac{1}{2}$  ounces of milk are given every two hours from 7 a. m. to 9 p. m. and this two hourly quantity is increased each day until, the sixth day, the patient is receiving some 3 quarts. On the seventh day a small piece of bread and a little jelly, fruit or preserves at breakfast time are permitted and at midday a full tray of easily digestible foods. The patient is encouraged to eat regardless of choice or inclination and to empty each dish on his tray. The portions are gradually increased until the patient is receiving an abundant diet.

At this time the patient is given an egg, soft boiled, poached or raw, with a little orange juice immediately after each of the three meals. Later on, two eggs are given. Extra milk is also given between meals. Many patients may, within two or three weeks, be induced to take six raw eggs, a quart and a half of milk and a pint of cream each day, in addition to three full meals. The daily dietary may thus reach an intake of 4000 to 5000 calories. The patient soon learns to take an interest

in watching the increase in weight and the coincident increase in red corpuscles and hemoglobin.

The pharmacotherapy is chiefly given in order to build up satisfactorily the patient's nutrition. On account of the gastric anacidity 20 to 30 drops of hydrochloric acid, dilute, with or without pepsin given with each meal and the same dose repeated one-half hour after each meal is recommended by Barker. This dosage is perhaps somewhat too large. In addition pancreatin, 45 grains, with calcium carbonate, 45 grains, is given three hours after each meal. A bitter tonic (10 minims of tincture of *nux vomica* in 1 dram of compound tincture of gentian) given ten or fifteen minutes before each meal may do something toward improving the appetite. This dosage also seems somewhat large and a smaller dosage or any other simple bitter would probably serve the purpose. With all this should go an encouraging psychotherapy, to overcome the extreme depression of these patients.

Of late, Barker and Sprunt have given arsenic in the form of sodium cacodylate, intramuscularly, 50 mg. per dose, once daily for eight days, and after an interval of two weeks a second course of eight injections. Cabot, and many others, as mentioned, do not find that the cacodylate has any advantages over the ordinary Fowler's solution.

The patient remains quietly in bed until the hemoglobin is above 60 per cent. and he then begins quiet resistive movement exercises. Rest in bed is maintained until the hemoglobin percentage is above 80 and the red corpuscle count above 4,000,000. Convalescence is then carried on very slowly. When the patient leaves the hospital he is warned to continue the hydrochloric acid treatment to overcome the permanent gastric anacidity and is also instructed in proper diet.

In cases where the blood count and hemoglobin were very low before starting the treatment, blood transfusion has been given to bring these up to a higher level.

The remarkable features of this disease are the rapid, extensive, severe and pernicious character of the blood

destruction and the no less striking powers of recovery under a good regimen when the hemolysis is halted. These powers of recovery should not lead the physician either to become doubtful of his original diagnosis or to believe in and to give too favorable a prognosis. Within even comparatively short periods of time the patient may suffer a relapse more serious than the original attack and not infrequently fatal.

### LEUKEMIA

This mysterious disease, whose cause is not yet accurately determined, is characterized by a persistent increase in the white blood corpuscles. Two forms are known, the splenomyelogenous, in which there is enlargement of the spleen and tenderness over the long bones and sternum and perhaps enlargement of the lymph glands, and the lymphatic type, in which the enlargement of the lymph glands is of greatest significance, the spleen increase being of secondary importance.

In the splenic type there is a large increase in myelocytes. The white corpuscles as a whole are increased, usually exceeding 150,000 per cubic millimeter. The polynuclear forms are greatly increased and eosinophils and mast cells appear in much greater number than normally.

In the lymphatic type, the number of lymphocytes is greatly increased, forming 80 to 90 per cent. of the whole. In some cases the total number of white cells is not increased, but the proportion of lymphocytes is much greater than normally.

The onset of the disease is insidious, among early symptoms being the splenic hypertrophy, enlargement of the superficial lymph glands, pallor, anemia and dyspnea. Local hemorrhages may appear externally or there may be hemorrhages into the internal organs. An irregular temperature with periods of pyrexia is not unusual. Gastro-intestinal upsets with nausea, vomiting and diarrhea also occur. In the acute forms of the disease death may occur in from four to six weeks.

## TREATMENT

Probably no problem which confronts the physician is more difficult than the treatment of leukemia. Seek and remove focal infection; then the main treatment is rest and nutrition, not unlike the treatment of pernicious anemia. In other words the treatment here, as in anemia, is an attempt to build up the resistance of the patient. As the finding of chief importance is the enormous increase in the number of white blood corpuscles, treatment has been directed toward counteracting this condition and lowering the count.

## ROENTGEN-RAY TREATMENT

The roentgen rays seem to check the growth of the hyperplastic white-corpuscle-producing tissues, but overdosage may prove fatal, and too small doses may actually overstimulate these tissues. Although it is uncertain just how the roentgen rays act in these cases, there is no doubt that remissions occur following exposure of the spleen or of the long bones. The disease is not cured, however, and the patients usually relapse. The action of the rays should be controlled by blood examinations made frequently. Burning of the skin must be carefully avoided. Radio-active substances fail in about 20 per cent. of the cases, according to the literature to date. The action and effect seem to be about the same as with the roentgen rays; the lymphatic form seems to be less amenable to the roentgen-ray reaction and recurrence is inevitable.

## BENZOL

Benzol is commended by some and denounced by others. It certainly should not be given with disease of the liver or kidneys, or with catarrhal intestinal trouble, and it should be suspended when the leukocytes have dropped to 20,000 or 25,000, before they have got down to normal figures. Von Koranyi (*Berl. klin. Wchnschr.* 12: 1357, 1912) first used benzene in the treatment of leukemia. All observers agree that the administration of benzene produces a marked rapid reduction of leukocytes, but the permanency of the improvement is not yet established. The benzol used



enterically is best given with an equal volume of olive oil, in hard gelatin capsules which may be first coated with keratin or salol before administration. It seems advisable to begin with a dosage of 5 minims of benzene three or four times a day and increase over a period of four weeks up to 30 minims three times a day.

Bourges (*Bull. de la Soc. Med. des Hop, Paris*, 42: 1149, Dec. 6, 1918) found marked improvement in leukemia following the administration of 50 drops of benzol in milk three times a day, although the improvement was not permanent and the patient subsequently relapsed, after which the benzol was unable to produce any effect. The treatment should be begun early in the disease, as it is in the early, almost latent stage that benzol may have its best effect.

Every ten days suspension of the treatment should occur so that the effects on the gastrointestinal tract may not be too marked. In the interval raying of the spleen or exposure of the spleen to radium may be tried.

The coincident administration of drugs to overcome anemia and the gastro-intestinal upsets is, of course, advisable.

Haughwout has recommended the use of benzyl benzoate. He makes no claim as to its therapeutic efficiency, but it has the merit of not deranging the alimentary tract and the kidneys. The initial dose is 10 drops of a 20 per cent. alcoholic solution in water three times a day after meals. In a considerable number of cases in which it has been tried the observers report general improvement in the symptoms.

Surgically, removal of the spleen has been performed in these cases but with no definite promise of permanent cure.

### HODGKIN'S DISEASE

The etiology of Hodgkin's disease is still doubtful. Once established, the disease may show remissions, but patients seldom recover and the physician is encouraged if his patient shows latency over four or five years. In 1913 a number of observers were able to grow a pleomorphic diphtheroid organism, gram-positive, in pure culture from the tissues in

this disease, and its introduction into animals resulted in establishing a series of similar changes in these animals. The disease manifests itself by a lymphangitis, perilymphangitis, and lymphadenitis. In the early stages the process is local, though an increase in the lymphoid cells of the blood is apparent. In the later stages there are definite toxemia and anemia, and still later with wide dissemination, edema, dysphagia, etc. In a complete study of this subject Bunting and Yates (*Jour. A. M. A.*, June, 1915) state that in the acute forms death may result in two to four months and in the more chronic forms life may be prolonged up to five years. One of the most characteristic features of the disease is the alternate periods of exacerbation and remission in the intensity of the process. During such remissions the treatment then in use is often given credit for the improvement.

#### BLOOD PICTURE

There are two types, an early and a late, showing a constant increase in the number of platelets with abnormally large forms and either a relative or absolute increase in the so-called transitional cells. In the early type the leukocytes are usually less than ten thousand; the lymphocytes are slightly above normal. In the late type there is a leukocytosis which may reach one hundred thousand, and the lymphocytes are reduced as low as 5 per cent. The transitional type may be above 8 per cent., the neutrophils being relatively increased to a percentage of from 75 to 92.

#### TREATMENT

Where the involvement is primarily cervical, even if the tonsils appear normal, a complete pericapsular tonsillectomy is indicated. If the primary glandular involvement is extra cervical, the source of infection must be found and the suspicious lesions appropriately treated. Excision of the cervical glands should be done as early as possible. Axillary dissections should be as extensive and as thorough as the cervical. It may be necessary to extirpate inguinal glands, as they are sometimes primarily involved. In later stages of the disease it is often difficult to make these severe

dissections. Burnam on the basis of observations in more than 100 cases advises against extensive operative removals. He uses radium treatment supported by rest in bed, forced feeding and iron. When radium is not available the roentgen ray is employed. The treatment varies with the individual patient and is guided by examinations of the blood at regular intervals.

Roetgen-ray treatment has often given rise to marked improvement, although recurrences seem inevitable.

Tonics may be indicated, iron and arsenic being preferable. Benzene has been given, but with no definite promise of success.

The patients should be examined at regular intervals to determine how they progress, and the prognosis should always be extremely guarded.

### PURPURA HEMORRHAGICA

This name should not be applied to every disease in which there are hemorrhagic spots (purpura) in the skin, but to the condition formerly known as the morbus maculosus of Werlhof. It is usually characterized by severe small hemorrhages not only into the skin but also into and from the mucous membranes. There may also be constitutional disturbances such as fever, nausea and vomiting. There may be hemorrhages from the nose, the rectum or from the stomach. The etiology of the condition is unknown. It has been attributed to changes in the blood or to changes in the walls of the blood vessels. The common belief is that the disease is caused by some alteration in the constituents of the blood. Duke has shown that in all of the cases of purpura hemorrhagica studied there was a marked diminution in the number of blood platelets. Whereas in normal cases the count is between 200,000 and 400,000, in purpura hemorrhagica it was below 10,000, many of the counts being below 1,000. He found the coagulation time normal and the clot at any bleeding point firm and without retraction. In this way a differential diagnosis could be made from hemophilia, in which the blood platelets are normal in number but the coagulation time is delayed.

## TREATMENT

As a result of the various etiologic studies of this condition the treatment has generally been aimed toward overcoming the deficiency in blood platelets. Thus blood transfusion is indicated with blood from a donor who shows a high count of blood platelets and whose blood is otherwise compatible. In addition to direct transfusion of blood, normal or citrated, human serum, etc., many have used intramuscular injections of whole blood in doses of twenty cubic centimeters. Some physicians have injected horse serum and achieved successful results. Frank gave arsenic in conjunction with local or intravenous injection of an extract of blood platelets. Halpern and others have reported the successful use of subcutaneous injections of various preparations of the blood platelets which are described in *New and Nonofficial Remedies*. Coagulen, for instance, is a yellow powder, readily soluble in water and not destroyed by sterilizing, prepared from the blood platelets of animals. When ready for use one grain is dissolved in 10 c.c. of distilled water.

Aside from the use of fresh air, good food, rest, and the various tonics described under the treatment of anemia, the use of calcium lactate to increase the coagulability of the blood has many advocates. This may be given in doses of gm. 0.15 or 2 grains every two hours or gm. 0.5 or  $7\frac{1}{2}$  grains every four hours or three times a day.

## HEMOPHILIA (BLEEDERS)

Hemophilia is a condition, usually hereditary, characterized by a decrease in the coagulation time of the blood and sometimes resulting in death from hemorrhage. The hemorrhage may be spontaneous, or it may be initiated by a cut, bruise or blow. The bleeding is not limited to any one part of the body.

Hemophiliacs, commonly known as "bleeders," are of the male sex. Female "bleeders" have been reported occasionally, but not enough evidence is furnished to show that these are true hemophiliacs. The disease is transmitted through the female members of the families to their male offspring. Such cases can be traced



through generations of families, several male members, but not all necessarily, of one generation being affected. Often the hemophilic tendency will make its appearance early in infancy, occurring at birth when the umbilical cord is severed.

Various theories have been advanced as to the etiology of this condition. These can be divided into two groups: (1) deficiency in one or more of the blood elements, and (2) deficiency in the elements of the cells of the blood vessel walls. In the first group the hemorrhage has been attributed to lack of calcium, deficiency of prothrombin, or to an excess of antithrombin. Weil has even claimed the presence of anticoagulants in the blood. On the other hand, it has been asserted that there is abnormal fragility of the blood vessel or that there is lacking in the cells of the wall a fibrin-forming substance—thrombokinase.

Certain factors relating to the blood in hemophilia have been definitely proved. It has been repeatedly shown that the coagulation time of the blood is prolonged. Normally blood will coagulate in from ten to twenty minutes; with the same methods for determining coagulation time of the blood in hemophiliacs, it has been shown that the coagulation time may be prolonged for as long as five hours. Hess states that the coagulation time should be taken at different periods, since occasionally it may approach normal. It is probable that on the occasions when it approaches normal there is admixture of juices containing thrombokinase from tissue at the site of puncture. Duke and others have shown that the blood platelet count in hemophilia does not vary from the normal, whereas in purpura hemorrhagica it is lower than normal. In exceptional cases, such as one mentioned by Hess, the calcium content has been found unchanged. Howell found a deficiency in prothrombin, the antithrombin being normal or only slightly increased.

#### SYMPTOMS

A hemophiliac may be unrecognized until hemorrhage occurs from a simple cause or spontaneously. Profuse epistaxis is frequent, or severe hemorrhage may follow tooth extraction, or there may be bleeding

into the stomach or intestines. The hemorrhage may be subcutaneous, following blows, and resulting in the formation of hematomas. A well known symptom of hemophilia is effusion into the joints. The larger joints are most often affected, particularly the elbow, knee or ankle joint. This hemarthrosis may first manifest itself by pain in the joint, soon followed by swelling. Occasionally fever is associated with it. The true nature of the condition is often not diagnosed, a common diagnosis being articular rheumatism or tuberculous arthritis. Operations based on incorrect diagnoses have resulted fatally. If the joints are not opened, but are treated gently by massage or heat, the effusion of blood disappears, sometimes within a few days, or sometimes only after weeks or months. Recurrences may follow, but the tendency for this grows less as the patient becomes older. Following one absorption of blood there may be a partial ankylosis.

#### TREATMENT

The treatment of hemophilia up to within a recent period has been as varied as the theories of its cause. Recently it has become more uniform because of successful experiences covering a large number of cases. Treatment may be general and local. It depends to a great degree on the location of the hemorrhage. If there has been considerable loss of blood, the patient should be supplied with sufficient fluids to help make up this loss. Milk is recommended, both on account of its calcium content and because of its nutritive value. If marked anemia is present, iron in convenient form should be given. This may be administered by the saccharated oxid, in 3-grain tablet, crushed with the teeth before swallowing, one tablet two or three times a day, after meals; as the reduced iron in 0.10 gm. dose, in capsule, two or three times a day, after meals; the Blaud pill, 3 grains, two or three times a day after meals, or the tincture of the chlorid of iron in 5-drop doses, in fresh lemonade or orangeade, three times a day, after meals. As has frequently been stated, there is no advantage in an organic iron over an inorganic iron, and there is no necessity of giving large doses of iron in simple anemia.

For directly shortening the coagulation time of the blood two methods have been tried. The first consists of the administration of empiric remedies supposed to supply one of the missing factors necessary for coagulation. Calcium in some form frequently is of benefit in these cases. It may be administered as simple lime water in tablespoonful doses, three or four times a day, given in water or milk; or as calcium lactate in dose of 0.3 gm. (5 grains) given in some solution three or four times a day. Calcium chlorid is perhaps most frequently used, but it is more irritant and of no greater efficiency than other forms of calcium.

#### SERUMS AND BLOOD

The best results obtained have followed the use of serums. Various kinds have been administered, among which are rabbit, horse and normal human serum. The serum has been used in different forms freshly obtained from the blood in the form of plain horse serum or weak preparations of diphtheritic antitoxin when other serum is not available; also solutions of the dried serum. Of late controversy concerning serum therapy has been confined mainly to the kind of serum producing the best results. All are agreed as to the value of serum in hemophilia.

Serum may be administered intravenously, subcutaneously, or applied locally to the bleeding point, if it can be reached. When given intravenously or subcutaneously, proper aseptic precautions should be taken. For intravenous injection, from 10 to 20 c.c. can be given every day until the bleeding stops, whereas for subcutaneous injection this dose should be doubled. The intravenous injection has great advantage over other methods, since by mixing intimately with blood it supplies more rapidly the absent elements necessary to increase the coagulability of the blood. When given subcutaneously, the serum must first be absorbed into the blood stream from the tissues; and before this can occur it will probably undergo a certain amount of change from action by the tissue cells.

Normal human serum, if this can be obtained, is without doubt the best to use, since it contains no foreign proteins.

It has been found that following the administration of rabbit, or more particularly, horse serum there occasionally follows definite symptoms to which have been given the name "serum sickness." This consists of a rise in temperature and the formation of an urticarial rash, the rash often being surrounded by an area of edema. The urticarial rash often fades into a scarlatiniform rash that lasts for several days.

Horse serum or diphtheria antitoxin is a most convenient remedy, as it is easily obtainable. The possibility of anaphylactic shock must be borne in mind and guarded against by first testing the patient with a small dose, as 1 c.c. given subcutaneously. It should be known that the patient does not suffer from asthma or hay fever from horse emanations.

Emile-Weil (*Bull. Acad. de med.* 82:374, 1919) found most marked improvement in his cases following the injection of serum. In one case serum failed until the patient showed a state of anaphylaxis through the development of urticaria and other signs of serum disease. This was followed by an immediate cure of the disease. Although it is dangerous to produce such a state it is possible to confer passive anaphylaxis on the patient by injecting small doses of serum from human beings or animals already in an anaphylactic state. The serum was prepared by injecting rabbits with small doses of horse serum and its use in sixteen cases is reported as satisfactory.

Whole blood injections should not be given into the veins unless preliminary agglutination and hemolysis tests have been carried out just as for transfusion in other conditions.

Good results have been reported from the use of tissue extracts applied locally to the bleeding point. These tissue extracts have been thyroid, ovary, liver, pancreas, kidney and spleen. The thyroid extract has been used most frequently. No good reason has been offered for the hemostatic properties of tissue extracts. Not infrequently profuse hemorrhages have been stopped by the administration of thyroid. While thyroid extract increases a liability to hemorrhage in most individuals, and may even cause menstruation or increased menstrual flow in some instances, in hemo-



philiacs it has at times been successful in stopping bleeding when other treatments have failed. Also, occasionally in profuse bleeding occurring at the time of the menopause, thyroid substance given in large doses, as much as 4 grains of the dessicated thyroid three or four times a day for a few days and then the dose reduced, has stopped bleeding when all other medication has failed.

As a last resort, transfusion itself may be tried. The usual precautions should be taken, the blood of both patient and donor being tested for hemolytic and agglutinative properties. A Wassermann test of the donor's blood should also be made. Ottenberg and Libman state that "every individual known to have hemophilia ought to have at his command several persons whose blood, by previous tests, is known to be compatible with his and who are willing, when called on, to give blood for transfusion." If these blood tests have been made a long time before, the character of the blood may have changed; therefore such tests should not be relied on, but fresh tests should be made. They also state that in transfusions some blood element is supplied that has been lacking, and on that account the cure is not always permanent as the supply is only temporary. They report a series of five hemophiliacs who were transfused, and in every case the hemorrhage stopped after transfusion.

Inasmuch as there is a high mortality in hemophilia unless the hemorrhage is promptly and completely checked, advantage should be taken of every available means to obtain serum or to make arrangement for a transfusion. If there is no source from which fresh serum can be obtained, and if for any reason transfusion cannot be done, horse serum or antidiphtheritic serum, which can always be procured, should be injected.

After a hemorrhage the patient is necessarily considerably weakened and may be anemic. He should then receive rest and supportive treatment as described in other blood diseases.

# DISTURBANCES OF THE THYROID

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## HYPERTHYROIDISM

The etiology of hyperthyroidism is not yet determined. There are probably many causes, but among the most frequent causes is focal infection, in the mouth or tonsils. Many cases seem to recover promptly after the removal of the infected material.

### SYMPTOMS

Disturbance from perverted thyroid functioning develops very insidiously as a rule. At first there are symptoms of a general nervous disturbance. Other symptoms are gastro-intestinal upsets; bruits, tachycardia, abnormal sweating, tremors, flashes of heat, digestive disturbances, signs of excessive mental irritation, and in women, menstrual disturbances.

### LABORATORY TESTS FOR HYPERTHYROIDISM

According to Goetsch, in states of hyperthyroidism there is a hypersensitiveness to epinephrin. In a positive reaction a subcutaneous dose of epinephrin is characterized by an early rise in blood pressure and pulse varying from 10 to 50 and normally proportional to the degree of toxicity present. There is also moderate exaggeration of the symptoms such as asthenia, tremor, throbbing, vasomotor changes, apprehension and nervousness. Experience shows that the test is a measure of the sensitization of the sympathetic or vegetative nervous system. Its value as a diagnostic test in hyperthyroidism is increased when blood and urinary sugar estimations are recorded with pulse rate blood pressure. Lueders (*Arch. Inter. Med.*, 24: 432, 1919) finds it cannot be relied on to any great extent, but there is a considerable difference of opinion.

Tests of sugar tolerance, nitrogen loss and acidosis have been made by Lueders in cases of hyperthyroidism. He believes the latter two are suggestive as aids in the diagnosis. Since the nitrogen metabolism is increased in exophthalmic goiter there is nitrogen loss

by way of the kidneys and bowel. The severer symptoms and the more striking signs of acute toxic goiter are suggestive of acid intoxication with depletion of the blood carbonates. The tests described under diabetes may therefore be applied and may reveal interesting information in cases of hyperthyroidism.

The best recognized test for hyperthyroidism is the basal metabolism determination as developed by Magnus-Levy, Ruber and many others. For this purpose the special Benedict apparatus is required.

Means and Aub (*Arch. Inter. Med.* 24: 404, 1919) found that the metabolism showed a definite reduction below that of normal individuals of the same age and sex in cases of hypothyroidism and markedly increased metabolism in hyperthyroidism.

#### TREATMENT

The treatment of hyperthyroidism is based on two main factors: alleviation of symptoms and removal of the foci of infection which may be responsible. These patients should have rest in bed, freedom from all excitement, and a modified diet for a few days before and after subjecting the patient even to such minor operations as tonsillectomy or extraction of teeth.

*Rest.*—In the treatment of hyperthyroidism some of the most important general factors are freedom from mental and physical fatigue, and from all excitement. Rest in bed is the best method of obtaining this, but cessation of work, and rest at home are in many cases sufficient. Exercise should be moderate, especially in those cases in which there is more or less tachycardia; otherwise, permanent injury to the heart may result. The digitalis preparations have practically no effect on this type of tachycardia; indeed, digitalis poisoning may result without any slowing of the pulse.

*Excitability.*—For the general nervous excitability, rest in bed is again the best treatment. Bromids may be used, but are apt to increase the general debility of the patient. Opiates are contraindicated even though they always reduce thyroid secretion. Calcium medication is sometimes beneficial.

*Diet.*—The diet in mild cases should consist of simple foods the variety of which need not be limited

except that it is better to eat but little meat. Tea and coffee should of course be omitted. Caffein, strychnin and other general stimulants are contraindicated, as they tend to aggravate the nervous symptoms. In the more severe cases a meat free diet is advisable. Dubois found by calorimetric studies that the metabolism of these patients averages one and a half times more than normal. His studies should make it clear that these patients require rest to diminish the metabolism and large amounts of carbohydrate foods to prevent loss of body fat and protein.

*Infective Foci.*—As already stated, an important factor in the treatment of hyperthyroidism is the removal of the foci of infection. With this in mind, teeth, tonsils, sinuses, gallbladder, appendix, genital organs, etc., should all be carefully studied and then treated as necessary to clear up any infection. The importance of completely clearing up foci of infection is illustrated by the way in which symptoms persist even after partial thyroidectomy when foci of infection remain unattended to.

*Specific Preparations.*—Iodin, iodids, thyroid extract and the crystalline active principles of Kendall's group, described later, generally aggravate the symptoms and so are contraindicated. The constituents of Kendall's Group B would be beneficial in those cases of exophthalmic goiter in which there are some of the skin changes of hypothyroidism. There are a number of preparations on the market that are derived from thyroidectomized animals which seem to be beneficial in some cases. The extract of thymus, epinephrin, and pituitary extract sometimes seem to alleviate the symptoms.

*Roentgen Ray.*—The roentgen ray has been used with excellent results. It should, however, not be used indiscriminately as, if not administered by a skilled radiotherapist, serious injury may result. The effect of radium on goiter is quite similar to that of the roentgen ray. Means and Aub found that exposure to roentgen ray and rest in bed benefited many of their patients. Coincident with the treatment occurred a reduction in metabolism to 20 per cent. of its former level. Holmes and Merrill (*Jour. A. M. A.* 73: 1693,



1919) found that exposure to the roentgen ray decreased the activity of the thyroid gland and destroyed glandular structure. It produced relief of the symptoms in thyrotoxicosis. Its effects are estimated through determinations of the basal metabolism. They recommend that the roentgen ray accompanied by rest be tried in all cases of thyrotoxicosis. Treatment should be continued for a sufficient length of time to destroy at least the thymus before trying surgery.

*Surgery.*—Surgery is at present a much used therapeutic agent in the treatment of hyperthyroidism. Ligation of the superior thyroid arteries and partial thyroidectomy are both of great value in alleviating symptoms. It is, however, generally recognized that relatively few cases of exophthalmic goiter are actually permanently cured by surgery. Some symptoms persist or recur, if only when the patient is fatigued or excited. Injections of boiling water, quinin and urea hydrochlorid, etc., have been recommended for destroying part of the gland.

*Thymus.*—Many cases of exophthalmic goiter are complicated by an enlargement of the thymus. The adrenals often are insufficient in this disease and epinephrin may be indicated to prepare the patient for operative treatment. Thymic hyperplasia greatly increases the risk in surgical treatment of the thyroid.

#### CONCLUSION

If the weight and strength keep running down and the heart functioning growing worse, an operation should be recommended without delay, but otherwise not until after a thorough course of medical measures. For operative treatment, the objective symptoms form the criterion. After operative treatment the patient requires medical oversight as much as after an operation for gastric ulcer.

#### SIMPLE STRUMA OF THE THYROID

It is possible that the simple strumous hyperplasias of the thyroid are due to an infection, but this has not been proved. The only cause for treating the colloid goiter which is causing no symptoms is to reduce the size of the gland, as a goiter is unsightly. Some colloid

goiters become large enough to interfere with deglutition and respiration: in such cases, of course, surgery is indicated. Iodin, iodids and thyroid extract are sometimes effective in reducing the size of the gland. E. C. Kendall's active principle of the thyroid may prove of value in some of these cases.

Removal of foci of infection may prove of value in the treatment of these goiters. If they are infectious, removal of the foci should at least stop further increase in size and also should make a change to the exophthalmic type most unlikely. So, removal of foci of infection is indicated even in the simple strumous goiters.

For the simple goiters of puberty little or no treatment is needed, as they usually disappear spontaneously.

### HYPOTHYROIDISM (HYPOSECRETION)

Hyposecretion of the thyroid gland, the cause of which is not yet known, may be present in the following conditions, either as a cause or as an accompanying complication:

Chlorosis	Melancholia
Amenorrhea	Slow growth in children
Obesity	Cretinism
Goiter	Adiposis dolorosa
Eczema	Lipomatosis
Hysteria (depressant forms)	Myxedema
Vomiting of pregnancy	Senility
Epilepsy	

Typical symptoms of hypothyroidea are best recognized and studied in the adult female. If there is absolute absence of secretion, myxedema develops. A normally diminishing secretion, such as occurs after 45 or 50 years of age, is shown by symptoms, the most evident being the addition of flesh, especially deposits of fat, a slowly increasing blood pressure, and a gradual development of connective tissue in various parts of the body. If this secretion diminishes normally as age advances into old age, the skin begins to lose its nutrition and dries and wrinkles, with a tendency to the occurrence of eczemas.

## PRINCIPAL USES OF THYROID

The *absence of menstruation*, after puberty, without pregnancy or acute or chronic disease, may point to a diminution of the thyroid and ovarian secretions. If the patient is anemic, iron and ovarian extract should be the treatment. If the patient is not very anemic and tends to put on weight, thyroid extract may be used in the treatment. The dose of thyroid should be small, not more than 3 grains, often less, of the dried extract once a day.

There has never been a satisfactory explanation of the condition of *chlorosis*. For some reason these patients do not metabolize the iron of their food. Large doses of iron always cure these patients. If these girls begin to menstruate normally the disease disappears, and thyroid extract acts as an efficient emmenagogue.

*Infantile obesity* is modified by small doses of thyroid, and if recognized early the condition may be inhibited. The disturbance in metabolism that is most frequently improved by thyroid is *obesity*. Thyroid will probably cause loss of weight in every instance provided a sufficient amount is given, but at the same time there is a great nitrogenous loss, and there is always the danger of causing disturbances due to an increased amount of thyroid in the blood, some of which may be serious. It can cause faintness and loss of strength, and a debility which may not be recovered from in a considerable length of time. If weight is being added, especially in women after 45, small doses of thyroid may prevent it. If the fat is already present, it may take considerable dosage to reduce it. The large doses which were once used for this purpose are not justifiable, and a patient under thyroid treatment for obesity should be very carefully watched, and the administration should cease as soon as any unpleasant symptoms appear. When weight is put on in younger life, especially in women, thyroid, and often pituitary extracts, is the most efficient treatment, and the dose required is generally not large. The value of combining such treatment with a diet free from sugar and with a diminished amount of carbohydrates, and with physical exercise, should not be

overlooked. The dose of thyroid should be 0.2 gm. (3 grains), at first three times a day for a week, then twice a day for another week, and after this once a day will probably be sufficient. To be sure that the thyroid is active, 0.25 gm. (4 grains) of sodium iodid should be administered once during each twenty-four hours. The patient may not begin to lose weight for at least two weeks, and after that some weight should be lost every week, and patients may lose weight even after the treatment has been stopped. The loss of two or three pounds a week should be considered sufficient and satisfactory. If the excessive weight is hereditary, or has persisted for years, the fat will again return on cessation of the treatment, and in these patients great loss of weight will not be caused by the treatment without the necessity for more thyroid being administered than is safe. Patients who are receiving thyroid should be watched carefully for symptoms of excessive thyroid administration. It is well to begin with a small dose and increase gradually. It has been suggested that the recumbent pulse be not permitted to go above ninety. When it does the treatment should be discontinued.

#### SIGNS OF HYPOSECRETION

If undesirable fat begins to be deposited before the age of 40, unless there is a marked family tendency to such excessive weight, the thyroid is probably undersecreting. If such deposits of fat occur on the hips, over and under the clavicles, on the upper arms, around the breasts in women, with a feeling of oppression, dyspnea on exertion, and especially if menstruation has ceased, the diagnosis is absolute that the thyroid is secreting insufficiently. If this condition just described further develops, *adiposis dolorosa* is in evidence, the only difference being that of degree and that the fatty parts are painful. The thyroid is always found to contain a large amount of connective tissue and to be subsecreting in this disease. In the rare instances of general and localized *lipomatosis* the thyroid is probably not perfectly active, although other signs of its inactivity may not be present. Thyroid



will always improve the condition of the skin even if it does not inhibit the advance of the disease.

Many *eczemas* of early childhood are often incurable until minute doses of thyroid are administered. These are especially the type that occur around the orifices of the body, and when fissures or cracks in the skin occur. The troublesome *eczemas* of old age often will not heal with local treatment until small doses of thyroid are added to that treatment. Sometimes the results obtained by such treatment of these patients is most satisfactory.

*Hysteria* of the melancholic, depressant type, where there is apathy, unwillingness to talk, and general depression, may be improved and cured by the administration of small doses of thyroid. The border-line between this kind of hysteria and beginning melancholia is hard to determine, but the cerebral stimulation caused by thyroid will sometimes prevent the development of insanity. Whether actual melancholic insanity is benefited by thyroid is doubtful, but it certainly is a treatment sufficiently logical to be tried in every case.

#### VOMITING OF PREGNANCY

There have been many suppositions as to the cause of the persistent *vomiting of pregnancy*. Whether it is purely reflex or whether there is a metabolic poisoning of the system of which vomiting is a consequence, it seems certain that any method that allows the mother to metabolize her food better, and eliminate the nitrogen excretory products properly, will be of benefit to her. Whether there is often or occasionally a subsecretion of the thyroid during the early months of pregnancy when vomiting is so likely to be in evidence is not known, but many instances have been reported in which the administration of small doses of thyroid has improved such a serious condition. It is certain that the thyroid will increase the nitrogenous output in the urine. It is also certain that the thyroid should hypersecrete during pregnancy. If it does not do so it is acting abnormally, and the vomiting of pregnancy may be an indicator of such a defect.

It is certainly advisable, when a woman has given birth to one or more children who have shown sub-

thyroid activity, to administer to her thyroid gland substance during her next pregnancy. Such treatment is logical, and has been successful in producing healthy children. If it is inadvisable to give small doses of thyroid to a pregnant woman or if its results are unsatisfactory, small doses of iodid may be substituted when it is decided that the patient's own thyroid is not secreting properly.

*Epileptic attacks* are frequently associated with arrests and deviations of body growth such as occurs in disorders of the internal secretions. In such cases thyroid in doses of from 3 to 5 grains daily (depending on the symptoms of the physiologic action of the thyroid) may be given in the intervals between attacks. Epilepsy developing at the menopause is often benefited by thyroid treatment.

#### MYXEDEMA

More or less complete insufficiency of the thyroid in adults causes *myxedema*. This is a rare disease in men, and occurs in more than 80 per cent. of all cases in women, and mostly in those who have borne children. It would seem from such statistical facts, that the gland is inclined to excessive atrophy because it has previously been overworked, in women, from the periodicity of its increased secretion on account of menstruation, and from its overwork during pregnancy. The treatment is thyroid; all of the symptoms disappearing. The dose should not be large, but if for any reason the treatment is rapidly pushed, the patient should be in bed lest sudden heart failure occur from the large doses of thyroid. As soon as the patient improves, the dose should be reduced; a dose of 3 grains of the dried gland substance a day is sufficient, and even this may subsequently be given but every other day, or even less frequently. Sometimes the thyroid gland of such a patient may be stimulated or may recuperate, or perhaps a supernumerary thyroid may develop so that active thyroid medication is needed only intermittently.

In operative myxedema in which the thyroid gland has been removed totally, or so much has been removed

that the secretion of the remaining portion is insufficient, or in some instances of true myxedema, in which the patient cannot live without continued thyroid treatment, transplantation or implantation of thyroid gland tissue into various organs of the body has been tried, sometimes with success. The same implantation has been tried in cretins, and there are records of success. The younger the patient, the more successful, perhaps, is the treatment, but the whole subject of such transplantation is as yet purely experimental.

### CRETINISM

In cretinous children the thyroid is either absent, or, if present, contains a small amount of colloid material or is cystic, and there is almost entire absence of thyroid secretion. The curative action of thyroid in cretinism is a demonstrated fact, and the sooner the diagnosis of cretinism is made, the greater the amount of success which will attend the use of thyroid. Unfortunately, the diagnosis of cretinism can rarely be made until the child is from 6 months to a year old, and if there is not total absence of thyroid secretion an infantile myxedema cannot be determined until the child is 2 or 3 years old. If a cretin or a patient with infantile myxedema is not treated until he is several years old the results of such treatment are much less satisfactory. The dose for an infant is not more than .065 gm. (1 grain) of the official thyroid powder, two or three times a day. If the cretin is older, the dose may be larger. Its unfavorable action is shown by increased cardiac rapidity and loss of appetite. Its favorable action is shown by a diminution of the myxedema; in other words, the puffiness of the skin becomes less, and there is an actual loss of weight. The mental powers should increase, and the hair, nails, teeth and bones should grow normally. The thyroid feeding, as soon as improvement has positively taken place, should then be slightly diminished, and a smaller dose given daily for months and perhaps for years. If unpleasant symptoms of thyroid action occur, the thyroid should be stopped for a week and then be again begun at a smaller dose.

## UNCLASSIFIED USES OF THYROID

Thyroid has been used with success in some instances of hemophilia and purpura hemorrhagica, as well as in the regular hemorrhages of the menopause.

It has been used in chronic rheumatism as well as in arthritis deformans, and has many times been successful in gouty rheumatism, especially where the attacks showed a general disturbance of metabolism, such as at one time an asthmatic attack, at another an indigestion attack, and at another a typical gouty joint attack. Small doses given for a considerable time are often successful in this kind of metabolic disturbance.

Sometimes thyroid acts as a diuretic, and it certainly is an antidote to nitrogenous poisoning in insufficient kidney action. Even uremic convulsions are sometimes kept in abeyance by the administration of thyroid. During a uremic attack the dose of thyroid should be large, as 10 grains of the dried extract three times a day. Such treatment sometimes apparently prevents convulsions and in some instances seems to aid in saving life. It has been used with success in puerperal eclampsia.

Thyroid has been used in various skin diseases, sometimes with success. The indication seems to be to stimulate extra secretion of the skin. If there is an acute inflammation or hyperemia, thyroid would not be indicated. Conditions in which it has been successful are the dry chronic eczemas, sometimes in psoriasis, ichthyosis, and in some instances of scleroderma.

If not otherwise contraindicated, whenever there is excessive connective tissue development in any organ—in other words, a sclerosis or cirrhosis—a small dose of thyroid daily is of benefit. The dose should be so small that it could not cause evident signs of its physiologic activity. In many of these instances small doses of iodid, given daily for long periods, may be of as much benefit.

## ACTION OF THYROID

The following description of the action of the thyroid extract is taken from "Useful Drugs": "Dried thyroid gland acts chiefly if not entirely through a



compound of iodine contained in it. When given in therapeutically active doses thyroid causes an increase of the nitrogen in the urine and a decrease in weight; it usually increases the absorption of oxygen and the elimination of carbon dioxide. It is one of the very few drugs which can properly be called stimulants of metabolism. The loss of weight is due mainly to increased catabolism of adipose tissue, although there is an increased breaking down of protein unless the diet contains an abundance of protein. With larger or long continued doses there is a very rapid action of the heart, nervousness, tremors, headache, flushing of the surface, sweating and much more pronounced loss of weight."

#### THE ADMINISTRATION OF THYROID

Unless thyroid is administered in large doses to combat an intoxication or toxemia, as in puerperal eclampsia or uremia, a therapeutic dose should cause no evident symptoms. In other words, if thyroid is to be administered continuously for its continued physiologic effect it should give no more symptoms than does the normal thyroid secretion. Large doses may cause nausea, dizziness, and, if quickly absorbed, faintness. There is probably no direct acute poisoning from thyroid, although large amounts have been known to cause convulsions and even death from shock, *i. e.*, by the toxic effect on the heart and the enormous vasodilator effect, as has been seen in operations for Graves' disease when the thyroid has been too much manipulated and a large amount of its secretion has been absorbed.

The treatment of acute thyroid intoxication would be the hypodermatic or intravenous use of epinephrin or post pituitary extract, the administration of atropin and strychnin. Possibly good treatment would be bleeding from one arm while physiologic saline was transfused into the other arm.

**Contraindications.**—Any symptom similar to those of exophthalmic goiter should ordinarily prohibit the use of thyroid. Also, if during the administration of thyroid excessive nervousness, sleeplessness, palpitation, and loss of weight occur, the administration

should be stopped. Ordinarily a poor condition of the circulation and a soft and weak pulse should prevent its use. Serious nervous and cerebral excitation should also ordinarily prevent its use.

*Official Preparation.* — Thyroideum Siccum, desiccated thyroid glands, is a yellow powder prepared from the thyroid glands of sheep. It has a disagreeable, meaty smell, and is partially soluble in water. This preparation, of course, contains the active principle of the thyroid gland, but its activity depends on the amount of the iodine content, and this is variable. It should contain about 0.2 per cent. of iodine. The dose varies from 0.03 gm. ( $\frac{1}{2}$  grain) to 1 gm. (15 grains), depending on the frequency and the object for which it is used. Thyroid may also be obtained in tablets which vary in size and strength.

#### KENDALL'S PREPARATION

Kendall has isolated two groups of active principles from the thyroid gland, the qualities and characteristics of which he summarizes as follows:

1. By an alkaline alcoholic hydrolysis, the thyroid proteins are broken into many simpler constituents. These may be separated into two groups: the acid insoluble compounds are designated Group A; those acid soluble, Group B.
2. From Group A a pure crystalline compound, containing 60 per cent. of iodine, has been isolated. It appears to be di-iodo-di-hydroxy-indol.
3. Group B contains iodine in some unknown form of combination. It is a mixture containing amino-acid complexes and a low molecular weight.
4. Administration of Group A produces in the dog and in the human being an increase in pulse rate and vigor, and increases in metabolism and nervous irritability. This physiologic activity is produced by the compound containing iodine in all stages of purity up to and including its crystalline form.
5. Given in excess, toxic symptoms are produced. The amount of the iodine compound required to produce toxic effects is exceedingly small.
6. In exophthalmic goiter two abnormal conditions exist: first, the secreting capacity of the gland is greatly increased and, second, the reservoir

capacity of the gland is greatly decreased. The iodine compound plays an important rôle in the production of the symptoms of exophthalmic goiter. 7. The constituents of Group B produce no toxic symptoms, but in cases of cretinism, myxedema and certain skin conditions, they exert physiologic activity. This active substance thyroxine can now be obtained through a manufacturer.

# DISEASES OF THE NERVOUS SYSTEM

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## CHOREA

Chorea — also known as chorea minor, Sydenham's disease, or St. Vitus' dance — manifests itself by muscular movements, mental irritability, sleeplessness, troublesome dreams and, perhaps, hallucinations. The most frequent age is from 5 to 15 years, and girls are affected three times as frequently as boys. Chorea is probably due to an infection and the frequency with which it follows inflammatory rheumatism, and chronic tonsillitis, as well as the common complication of endocarditis, indicates an organism of the streptococcal series. In the search for its cause all foci of infection should be removed and all irritating factors such as constipation, worms, pruritus, headache, etc., controlled.

## TREATMENT

As will ordinarily be noted, the child with chorea is anemic, restless, illy nourished—in fact, just the type to show a low resistance to infection. The primary indication to be met, in view of this fact, and in view of the hyperirritability of the sensory-motor system is rest. It may be well at the outset to insist on absolute rest in bed for a few days or weeks. The child should be shielded from sources of irritation such as school work, other children, hard playing or even much walking. During the period of rest, massage and passive motion may be instituted to prevent too great disuse of muscles and secondary atrophy.

The diet should depend on the acuteness of the symptoms, whether fever be present and in relation to the patient's appetite. A goodly quantity of a good milk may be freely given. Meat should be allowed in small quantities only, and such excitants as tea and coffee should be absolutely eradicated.

Hydrotherapeutic and physical methods are undoubtedly of great value in chorea. The warm



bath is sedative and may be given daily or every other day. When accompanied by systematic massage or graded exercises it may achieve markedly good results.

Patients with chorea should be thoroughly examined and local foci of infection, such as carious teeth or diseased tonsils, should be promptly eliminated. Furthermore such sources of continued irritation as phimosis, otitis media, worms, or adenoids should receive adequate attention.

It has been suggested that some of these cases are stimulated by purely mental obsessions. An analysis of the mental processes with free questioning by a physician who has gained the patient's confidence may reveal such a hidden source, and an adequate explanation may be of invaluable aid in clearing up the symptoms.

#### MEDICINAL TREATMENT

Arsenic, as Fowler's solution, has long been a highly praised treatment for chorea and seems to succeed in some cases but most patients are probably better off without it.

The patient's bowels should be kept open and elimination encouraged by the use of laxatives such as castor oil and phenolphthalein. If there are joint pains, salicylates should be given. The heart should receive special attention, as it is frequently affected in chorea.

If the twitching becomes violent or severe, it should be checked by the use of a hypnotic, and chloral is generally recommended for this purpose in a dosage sufficient to cause sleep—perhaps 5 grains every four hours for a child 6 years or upward. After the movements have ceased and the child is convalescent, iron should be given.

A patient who has recovered from an acute chorea should be given an outdoor, quiet life for several months, and school work should be absolutely prohibited. If the chorea has occurred at the time of puberty in girls, all excitement and the strain of school life should generally be forbidden until menstruation is regularly established.

## AUTOSERUM TREATMENT

A considerable amount of literature has accumulated favorable to autoserum treatment in this disease. About 50 c.c. of blood are withdrawn from the patient's median basilic vein and centrifuged from thirty to forty minutes. The serum is pipetted off under sterile precautions into a sterile test tube and put into an incubator where it is kept at proper temperature for injection. The serum is injected intraspinally and preferably in a hospital where proper care can be given to the patient. No solid food is given for six to eight hours following treatment. The symptoms subside and if they reappear further treatments may be administered at intervals of not less than one week. The average amount of serum employed per injection is 17 c.c. and the average number of treatments required in each case, three.

## EPILEPSY

The convulsions of epilepsy in a typical attack are sufficiently well known and require no renewed description here. The etiology of epilepsy is unknown. There exists one class in whom the seizures are definitely related to certain traumatic lesions of the skull, brain or meninges, or to some actually demonstrable lesion in the brain. This type of case may often be relieved by operative methods. Another type of epilepsy seems definitely associated with intoxication. Of this theory there are many adherents. Another point of view of the origin of many cases of true epilepsy has been presented by L. Pierce Clark after years of study of this disease. Clark believes that true epilepsy is a psychosis, and that each case should be studied with that idea in mind.

Gowers and others have stated distinctly that often there may be a hereditary tendency to epilepsy. Still other observers are convinced that a state of alcoholism, lead poisoning, or other poisoning in either parent at the time of impregnation may be a cause of epilepsy. Turner has defined as idiopathic epilepsy "a chronic disease of the brain characterized by the recurrence of seizures in which interference with consciousness is an essential feature, associated either with convulsions or transient psychological phenomena,

occurring usually in persons with an hereditary neuropathic endowment and eventually leading to more or less permanent mental impairment and dementia." In other words as, stated by Dercum, "One fact is prominent in all this, namely, that epilepsy is not a specific entity but includes many symptom groups which differ widely as to their origin and pathology." Perhaps the most practical view to adopt is that stated by MacRoberts (*Jour. A. M. A.* 74: 1000, 1920) after analysis of the whole subject: Epilepsy means a tendency to recurrent convulsions; such a tendency implies a more or less generalized cortical instability; epilepsy is therefore not properly due to any cause outside the brain.

### TREATMENT

If the patient is in the midst of an attack, measures should be instituted to prevent him from being injured by the movements which accompany the convulsion. It is important that chewing of the tongue be prevented. Immediately after an attack the patient should be permitted to rest and recuperate before any active steps are taken to secure a history or to institute treatment.

When one fit succeeds another in rapid order the patient may die, and the immediate administration of a large dose of chloral or bromids, or both, may be considered. The following mixture has been recommended:

	Gm. or C.c.	
℞ Chlorali hydrati.....	5	3 iss
Sodii bromidi.....	10	or 3 iii
Elixiris aromatici.....	50	fl℥ ii
Aquae ..... q. s. ad	100	fl℥ iv

M. Sig. As the physician directs.

[Each teaspoonful of the above, i. e., 5 c.c., represents 0.50 gram (7½ grains) of bromid and 0.25 gram (4 grains) of chloral.]

Chloroform inhalation will serve to stop and prevent these terrific seizures.

### GENERAL TREATMENT

It is evident that the treatment of the epileptic cannot be successful unless the etiologic factor in the individual case is determined and eradicated if possi-

ble. A study of all possible cerebral causes should be made, including roentgenograms of the skull taken in various positions. If the history of the case or the roentgenograms show that operations on the cranium are likely to be of value, expert cerebral surgery should be done.

Roentgenograms should be taken of the intestine after bismuth feeding. Finally, the patient should be studied psychically. The greater the hereditary tendency to the disease, probably the worse generally is the prognosis of entire recovery. Permanent incurable lesions in the brain or meninges make the prognosis bad. The importance of intestinal stasis causing absorption of toxins and the curability of such stasis medicinally, mechanically or operatively should be emphasized. The necessity of psychic study and psychic treatment of epileptics should also be realized.

The necessity of epileptic colonies and public institutions for the study and care of epileptics is now being recognized, and they have been inaugurated by a number of states. The importance of good, clean air, of outdoor work, or of indoor work under the best hygienic surroundings, has been shown to diminish the number of epileptic attacks. It is also well known that such patients as are not idiotic will care for each other during an epileptic attack; therefore the nursing care of these patients in detention colonies is not great.

Constipation must be prevented, and the diet should be such as to cause the least possible production of toxins in the intestine. Generally, the lower the meat diet, the better for the patient, and all foods that contain large amounts of nuclein bodies, such as sweetbreads, liver, shad roe, etc., should be tabooed. Milk, eggs, fresh fish, peas, beans, vegetables, cereals and fruits make the best food for the epileptic. It is wise, when there is an opportunity, to individualize a patient's diet by ascertaining, under the different foods, the character of the digestion, by examining the twenty-four hours' urine and the twenty-four hours' feces; but in public institutions where a large number of epileptics are handled, such examinations are almost impossible. The determination of the amount of indican in the urine, however, is indicative of the amount of



intestinal indigestion, and indican in the urine in any amount should cause a change of diet and the administration of foods or drugs that will cause more profuse movements of the bowels.

Several observers have reported marked improvement when the use of sedative drugs was combined with a salt free diet continued over a long period of time.

It has frequently been noted that epileptic attacks may occur in women at the time of the menopause, or in girls and young women when there is amenorrhea or delayed menstruation. The cause has been thought to be due to an intoxication caused by the changed metabolism, due either to insufficient elimination of nitrogenous waste products by menstruation, or due to a relative insufficiency of the thyroid gland at these times, and the thyroid is known to have detoxicating power. This inference has been borne out in many instances by thyroid feeding diminishing the number of epileptic attacks, and even curing some cases. It is possible in this polyglandular disturbance of ovaries, corpora lutea and thyroid that the pituitary gland becomes involved, and its disturbance may cause the epileptic attacks. Focal infections, especially of the mouth, may be a cause of epilepsy, hence they should be sought and removed.

#### MEDICINAL TREATMENT

If the patient has an aura preceding his attack, he may be provided with pearls of amyl nitrite, as it has been found in some instances the attack may be aborted by the inhalation of this substance.

As constipation and intestinal intoxication seem to be important factors in the course of this disease, laxatives should be used as indicated by the patient's condition. It may be advisable to cease feeding for several days, as is done in diabetes, and then gradually evolve a diet under which the patient shows symptomatic improvement.

Since Laycock, more than fifty years ago, introduced the bromid treatment of epilepsy, no other drug has been found more efficient in controlling the seizures.

It probably is not often true that a combination of several bromids acts better than one bromid. The main point to remember, as so well emphasized by Clark, is that bromids may do a great deal of harm as well as a great deal of good. Sodium bromid can probably be taken longer without causing harm than can potassium bromid. There is no possible advantage of strontium bromid over sodium and potassium bromid; it is more expensive, but is absorbed less rapidly, and more of it is probably lost in the intestinal canal. This has caused the belief that strontium bromid causes less unpleasant symptoms than either sodium or potassium bromid. If the dose of either of the last two is reduced, the unpleasant symptoms will be no more in evidence than with strontium bromid. Ammonium bromid is intensely disagreeable to take, and has no advantage over the sodium and potassium bromid. The other bromids are not worth mentioning. Calcium bromid and zinc bromid are entirely unnecessary drugs.

The enormous doses of bromids given not only do harm, but also are entirely unnecessary, and it is probably a fact, the same as is true of enormous doses or iodids, that only a certain amount will be absorbed and circulate in the blood; the large residue of enormous doses of salts passes out of the system unutilized. It has also been well proved that if sodium chlorid is partially or entirely removed from the diet, smaller doses of bromid are effective, because they are absorbed more readily and act when there are less salts in the system. The smaller the dose of bromid that will cause a diminution in the number of epileptic attacks, the less is the nutrition of the body disturbed, the less are the internal secreting glands disturbed, the less are the blood-forming organs disturbed, the less the skin is irritated by the bromid, and consequently the less are eruptions likely to occur, and the less the kidneys are disturbed by not being compelled to excrete large amounts of salts.

It should once more be emphasized that the administration of bromids will probably always reduce the frequency of the attacks, and in some instances may apparently cure epilepsy; but this symptomatic treatment is always to be regretted. In some cases due to

nervous irritability when the attacks are due to some nervous reflex, bromids may be curative; but the future of long bromid treatment means mental and physical deterioration.

Most recently luminal—phenyl-ethyl-barbituric-acid—a drug described in New and Nonofficial Remedies, has been highly recommended by many neurologists, especially as a substitute for the bromides. The dosage is from 0.2 to 0.3 gm. (3 to 5 grains) several times a day. This dosage may be increased to 10 grains but should never exceed 12 grains. The drug in large doses kills by causing respiratory paralysis. No renal injuries or gastric disturbances have been observed following its employment.

### HEADACHES

The causes of headaches have been divided by Osborne into several large classes: toxic, circulatory, local and reflex.

TOXIC	LOCAL
Fever	Eye inflammations
Auto-intoxication	Frontal sinusitis
Intestinal	Ethmoiditis
Kidney insufficiency	Ear inflammations
Liver insufficiency	Meningitis
Thyroid disturbance	Exudates into the ventricles
Drugs	Changes in the cerebral vessels
CIRCULATORY	Tumors
Valvular disease	Syphilis
Venous congestion	REFLEX
Plethora	Eye-strain
High tension	Nasal disturbances
Arteriosclerosis	Aural disturbances
Anemia	Facial neuralgias
Leukemia	Uterine displacements (?)
Lung consolidation	
Diminished aeration	

In the first three classes mentioned by Osborne, anything that removes or corrects the serious underlying condition will remove the headache of which the patient complains. It is in the fourth class, Osborne believes, that a failure of diagnosis of the cause is most frequently made, and it is this class that constitutes about 90 per cent. of all cases of headache that come

to the physician. It is his belief also that 90 per cent. of this fourth class suffer from headache because of some ocular trouble.

#### EYE-STRAIN REFLEXES

The most constant condition caused by eye-strain is, of course, the headache. This headache may develop slowly or rapidly, may be centered in one eye, one side of the forehead or one side of the head, or may be referred to both eyes. In fact there is no part of the head that may not ache from eye-strain. Very frequently, however, one eye is more likely to be affected than the other, and one eye is likely to be unlike the other eye and be more defective than the other eye. Astigmatism and far-sightedness, or both, are the most frequent causes of eye-strain headache. Weakness of the ocular muscles is another cause.

The pain is perhaps most frequent in the supra-orbital region, but is often in the temple, and may be frequently referred to the inner angle of the eye, especially if there is astigmatism. It perhaps occurs very frequently in this region on account of the overactivity of the superior oblique muscle which endeavors to overcome an astigmatic mistake. Headaches from defective vision from any reason, and especially when a person becomes presbyopic and has not glasses to correct it, or at least has glasses that are insufficient to correct it, are more likely to be in the occipital region. Such headaches most frequently occur in the early morning, and are discovered by the patient on awaking.

Eyes that are defective as ocular instruments are likely to be inherited, certain kinds of eyes appearing in different members of the family, the children suffering the same defect from which the parents suffered. Some children are likely to have the headache begin at any age, but perhaps most frequently after a year or more of school work. These headaches are likely to come periodically, perhaps once a week, perhaps once in two weeks, perhaps only once a month, but with a constant tendency to become more frequent little by little. They sooner or later become a megrim, or migraine, which is typically a headache for a number of hours followed by nausea, vomiting, prostration, sleep, and recovery.



The title given to most of these headaches by the laity is "a bilious attack," and the cause is attributed to overeating, eating at night, eating indiscriminately, or is attributed to particular kinds of food, which, if the patient is old enough to decide for himself, are gradually removed from the diet, until almost every kind of food and drink are subjected to more or less suspicion. He then attributes his trouble to his liver, or finds serious fault with his stomach. If he is constipated, he lays it to that, as he finds that after free catharsis, or at least after such a length of time as a cathartic will generally act, the headache disappears. He, therefore, thinks it is due to constipation. Girls and women with these eye defects are more likely to have headache before or during menstruation, and they attribute it to that function. Others learn that they get these headaches when they are overtired, mentally or physically. Some soon learn to become suspicious of their eyes on account of having a headache after theater-going, card-playing, car-riding, shopping, sewing, or reading too long, or, if they are office clerks, after an extra amount of proof-reading or of mathematical work.

After the headache habit has once been formed a neurotic element enters into it, and there is likely to be a cyclical headache, even if the eye defect has been corrected, so that a patient who has the headache habit thoroughly formed will always have them more or less, at least until the eye becomes presbyopic and focusing for near objects has almost been abolished. It is also true that neurotic patients who are subject to high tension and nervous irritabilities are more likely to have headaches from slight eye defects than are more calm and less nervous individuals.

All physicians now more or less recognize recurrent headaches as due to eye-strain, but a large number do not recognize that the patient may have stomach and heart reflexes without headache, and still due to eye defect. Dizziness, gastric indigestion, even nausea and vomiting may occur without any headache whatever and still be due to eye-strain. Cold hands and feet,

chilly sensations, faint feelings, palpitation, and irregular heart and pain referred to the cardiac region so as to cause the patient to believe he has heart disease, may be due to eye-strain and be corrected by correcting the eye defect.

### TREATMENT

Patients with migraine are prone to become early victims of the nostrum promoter. The headache cures are as varied, if not more so, as the causes of this symptom. Practically all of them contain drugs of great toxicity or else consist of worthless mixtures with no appreciable effect. Recently acetylsalicylic acid (aspirin) has become the mainstay of the large group of laity who purchase headache "cures" in preference to consulting a physician.

In all cases of migraine treatment should consist of first, a sufficiency of outdoor exercise; second, a simple, varied, well-balanced diet; third, there must be free, daily movements of the bowels.

Of those headaches due to ocular and reflex conditions, Osborne believes that nothing is more helpful than acetanilid. The dose should not be large and it is well to combine the drug with bicarbonate of sodium. While caffein adds to the toxicity of the coal-tar product, caffein has a useful action in curing a headache of the eye-strain class. If much of a dose of a coal-tar product is given, the patient should lie down for several hours, if possible. Otherwise, the cardiac depression caused by the eye reflex plus the depression caused by the coal-tar drug will produce faintness and more or less temporary debility. While acetphenetidinum (phenacetin) is perhaps a safer coal-tar drug to use, the dose must be so much larger than the acetanilid dose that the depression is about the same. With some patients antipyrin, acetylsalicylic acid or pyramidon works the best. Some find cold to the head of advantage, although with many it causes nausea. Others find hot applications satisfactory. Sometimes a hot foot-bath will change the circulation sufficiently to relieve the head congestion. Some

patients are cold, and some feel hot, and the circulation on the surface of the body is likely to vary, depending on the intensity of the pain or the occurrence of nausea.

Opium treatment for these headaches is undesirable. On the other hand, one is often driven by the very intensity of the condition to the limit of medicinal resources, and sometimes cardiac depression is so serious that it becomes a question of either morphin or large doses of alcohol. Patients who have these terrible attacks frequently cannot well stand coal-tar products so often repeated, as, unless the dose is enormous, the result of their administration is nil. A morphin habit and an alcohol habit, to say nothing of the frequent acetanilid habit or caffein habit, may be acquired on account of eye-strain headaches.

It is hardly necessary to mention the reflex head pain that may come from a bad tooth, from an inflammation in the antrum of Highmore or the frontal sinus, or from inflammations in the ear, as these diagnoses of causes of headache should be readily excluded.

It should be remembered that frontal headache is frequently caused by syphilis.

It should also be remembered, if there is insufficient pulmonary ability, whether from tuberculosis, emphysema, pleurisy with effusion, or asthma, that this lack of proper aeration may cause headache.

At times gastric hyperacidity and uterine displacements may be reflex causes of headache, but such causes are rare.

The wearing of heavy hats may be the cause of headaches in girls and young women, to say nothing of the pernicious spotted veil.

# FOR HEADACHE

	Gm.	
℞ Caffeinae citratae.....	2	3 ss
Sodii bromidi.....	20	or 3 v
Sodii bicarbonatis .....		
Acidi tartarici.....āā	10	3 iiss

M. et fac chartulas 10.

Sig.: One powder in half a glass of water, and repeated in six hours, if needed.

[In order that these powders may effervesce well they must be kept dry.]

Or:

	Gm.	
R Acetanilidi .....	50	gr. viiss
Caffeinae citratae.....	25 or	gr. iv
Sodii bicarbonatis .....		
Acidi tartarici.....āā	5	gr. lxxv

M. et fac chartulas 5.

Sig.: One powder, in half a glass of water, every three hours, if needed.

[In order for these powders to effervesce well they must be kept dry.]

Or:

	Gm.	
R Acetphenetidini .....	1 50	gr. xxiiss
Caffeinae citratae.....	25 or	gr. iv
Sodii bicarbonatis .....		
Acidi tartarici.....āā	5	gr. lxxv

M. et fac chartulas 5.

Sig.: One powder, in half a glass of water, every three hours, if needed.

[In order for these powders to effervesce well they must be kept dry.]

## SCIATIC NEURALGIA AND SCIATIC NEURITIS

While the sciatic nerve or its branches may transmit painful sensations, the nerve itself may not always be affected, as pathologic conditions of the hip joint (arthritis, tuberculosis or tumor growth, as sarcoma) may cause pain down the sciatic nerve.

As with backache, a patient who has sciatic pain should be carefully examined to determine, if possible, the cause. True sciatica is generally a perineuritis, from which this nerve suffers more than almost any other nerve of the body. Sciatica may be either acute or chronic. In the acute form it is perhaps the cause of more continuous and repeated suffering than almost any other curable disturbance.

Hunt offers a classification of sciatica which suggests etiologic treatment. Unless the cause of the pain is removed, the nerve will continue to cause symptoms. According to this classification, the causes of neuritis are:

1. Intrapelvic disease, such as specific exudates within the pelvis, in venous congestion, pressure from a pregnant uterus, new growths, and a loaded rectum.



2. Constitutional states, such as syphilis, alcoholism, etc.
3. Damage to the nerve trunk from injury or exposure to cold.
4. Damage to the sacro-iliac joint.

The most frequent cause of sciatica in women is pelvic disturbance and pelvic pressure. In men a rheumatic and gouty tendency is frequently an associated cause, and exposure to cold seems to be a frequent exciting cause. A possibly important factor in the development of sciatica is the compression of the nerve against the tuberosity of the ischium by asymmetrical sitting on a hard seat.

The disturbance of equilibrium caused by a weakened plantar arch or other foot disturbance must be considered, as well as the possibility of a heavy patient lying in bed too long on his side, and thus causing pressure in the region of the hip. The springs of the bed and mattress, with extra pillows and cushions if necessary, should be so arranged as to relieve all possible continued injury to the sciatic nerve.

When the cause of the disturbance is considered to be a general one, a possible focus of infection should be sought. A frequent cause in adults is infection in and around teeth, or possibly in a tonsil.

Besides syphilis and alcohol as causes of sciatica, diabetes and malarial poisoning should be considered. Impaired circulation in the legs, from varicose veins or from insufficiency of the heart, may perpetuate sciatica after it has once started, and treatment in such instances must be directed toward improving the circulation.

#### SYMPTOMS

It is hardly necessary to refer to the symptoms of neuritis of the sciatic nerve. Often a patient can map out the course of the nerve by describing where he feels pain, and if not pain, where he feels twinges or peculiar sensations of irritation. There may be, after some days of a real inflammation of the nerve trunk, regions of paresthesia in different parts of the leg supplied by branches of this nerve, and still later there may be impaired mobility of some muscles. The pain may be so severe as to be tearing or boring in

character, and there may be attacks of cramps or contractions of one or more muscles causing very intense pain. There may be some reddening of the skin along the course of the nerve, local elevation of temperature, and rarely some edematous symptoms. The electric excitability may be increased at first, and later diminished. The patellar reflexes are normal at first, and later may be diminished. Occasionally a herpes may occur; there may be some local sweating, showing trophic disturbance. In chronic sciatic pain, the sensation may become almost a habit or a condition expected by the patient, so that the general neurotic condition must be treated more than the local pain.

#### GENERAL TREATMENT

Besides removing the cause of sciatica, if such is possible, the general treatment is important. The diet should be modified according to the general condition. In some instances meat should be removed from the diet. In other instances it should not be withdrawn; in fact, protein should be pushed and nutrition increased. Constipation should always be prevented. The treatment may be started with a brisk purge, by castor oil or calomel. The bowels should be moved daily, with salines if there is plethora, overweight and a good heart, and with vegetable laxatives if the patient is underweight, anemic, or with poor circulation.

Rest of this nerve is of primary importance, even if there is only a neuralgic condition, that is, an irritation without a neuritis or perineuritis, and it is imperative when there is a neuritis or perineuritis. A neurotic habit of the individual should always be noted. If such is present, this pain, like any other, will be harder to combat, and the main treatment should be toward the general condition, whether neurasthenic, hysteric or plainly neurotic. Like any other painful nerve, it must be kept warm. Warmth is one of the most important elements of local treatment.

In acute inflammations of this nerve the pain is so excessive that generally morphin must be given. But before morphin is resorted to, the leg should be immobilized and sometimes made rigid with a long splint. It is generally best not to give atropin with

morphin, as atropin acts only on the peripheral endings of nerves, and in this case the nerve trunk is in trouble, and the atropin will combat somewhat the sedative action of the morphin. Also the morphin may have to be repeated more frequently than it would be wise to repeat the atropin. When the pain is not sufficiently severe to require morphin, antipyrin will sometimes act as a valuable sedative; also novaspirin, especially if the patient is rheumatic, or atophan, of which the analgesic and other qualities have been mentioned elsewhere.

### LOCAL TREATMENT

Besides the local treatment already suggested, dry cupping and cauterizing, and at times blistering along the course of the nerve, may be not only of temporary but also of permanent benefit. Sometimes the d'Arsonval current or diathermy is of benefit in subacute and chronic cases. Sooner or later, gentle massage is of benefit.

When this nerve is somewhat stretched and at rest, especially when the leg is surrounded by dry heat, as by hot sand bags or other methods of applying heat, excruciating pain may entirely cease. Such patients are fortunate, as narcotics need not be given.

If there is a rheumatic condition present, large doses of salicylates are of benefit. Alkalies are frequently of service, such as potassium citrate in 2 gram doses, in wintergreen water, given three or four times in twenty-four hours. If there is nervous irritability and considerable cerebral irritation, bromids are of value, but they should be soon discontinued, as they interfere with nutrition and are very depressant, and calcium should be substituted.

Sometimes warmth is well applied to this nerve by a cradle containing electric lamps, and the leg is subjected to this kind of heat and the resulting local sweating once or twice a day for from fifteen minutes to half an hour.

High-frequency currents have been applied to this painful nerve, sometimes with good results; but often electricity in any form is not well tolerated, however diathermy may be of great benefit.

Ethyl chlorid spray along the course of the nerve or in different painful regions of the nerve has been reported to be successful in modifying the pain. Epi-neph rin ointments have been gently rubbed into the skin along the course of the nerve with some success.

Salt solutions, cocain solutions and beta-eucain solutions have been injected around the nerve sheath in prolonged acute and subacute cases, with considerable success. The injection treatment with sterile water or sterile physiologic saline solution is an old treatment, recently revived. This treatment is not advised in every case of sciatic pain, as many individuals are benefited and recover with ordinary local and constitutional treatment; but when the inflammation and pain persist, it is perhaps the most successful treatment. The technic is very difficult and usually best left to the specialist.

Beta-eucain has been used as an infiltration injection in strength of 0.1 per cent. solution and 100 c.c. in bulk. Cocain has been used in 1.5 per cent., 2 c.c. in bulk, followed by 100 c.c. of physiologic saline solution.

Injections of small bulk into the sheath of the sciatic nerve, called nerve blocking, have been done frequently in the severe forms of sciatica. A hypodermic syringe full of plain, cold water has been used, also cocain solutions, and sometimes morphin solutions.

Whatever injection treatment is done, the treatment should be considered radical, and should be done by one who has become proficient in this operative therapy, as sometimes uncomfortable symptoms are developed.

The injection of alcohol has been shown by Cadwalader to be unjustifiable, as alcohol destroys nerve tissue. He found that salt solution injection into the sciatic nerve did not cause any degeneration, while strong alcoholic solutions caused destruction of nerve tissue.

Rosenbeck and Finkelstein found that only 20 per cent. of patients with sciatica could be relieved by injections into the nerve or its sheath.

Stretching the sciatic nerve has been recommended for many years, and is sometimes of great value in relieving pain, especially if the nerve and leg are then



put at rest, allowing the inflammation to heal. This may be done nonoperatively, by extending the leg in various directions and thus stretching the nerve.

### BRACHIAL NEURITIS

Brachial neuritis may be produced by any of the chronic constitutional poisons, such as lead, arsenic, alcohol or tobacco; by uric acid disturbances; by altered metabolism of proteins; by insufficiency of the kidneys, by diabetes and by mouth infection. It may occur also from straining or injury to the brachial nerves or the brachial plexus. Lying on the arm at night frequently produces a brachial neuritis. The pain is particularly severe in the neuritis occurring in diabetes, but it may be severe from any cause. Pain shooting down the brachial nerves may be due to pressure from neighboring structures, as when there are rudimentary cervical ribs, or a subdeltoid bursitis.

The primary treatment depends on the etiology, and as in sciatica and in backache, a complete history should be secured and a careful examination of the patient should be made to determine the predisposing or exciting factor. This should be removed if possible. When the neuritis is due to some general poisoning, and perhaps always unless the patient is greatly debilitated, purging on several days, or alternate days, with a complete change in the diet, is a beginning treatment that may be valuable. Anything that causes pressure or injury to the brachial nerve or the brachial plexus must be removed before treatment will be at all successful. Any occupation or use of the arm that perpetuates the trouble must cease.

In rheumatic and related conditions, a course of sodium salicylate followed by a course of alkalies in conjunction with a vegetable and cereal diet will often be of rapid benefit.

If the pain is so severe as to prevent rest and sleep, the temporary use of narcotics may be necessary, and some hypnotic, as chloral or the bromids, is often advisable, at least for a short time. One of the coal-tar products may be of value. None of these depressants, however, should be long continued.

A patient with brachial neuritis rarely needs to go to bed; if he carries the arm in a sling he will get comfort and rest for the nerve, and have much less pain. The sling should support the elbow so that the arm will not drag on the painful muscles. At night, or at periods during the day, dry heat, as represented by an electric pad or a hot water bag, is of benefit. As in treating any other sore or painful nerve, the region should be kept warm with flannel or cotton. Sometimes gentle stroking upward, or massage along the course of the nerve to promote the flow of the lymph in the lymph channels, is soothing and relieves local congestion. Later, the arm may be extended and stretched, by the physician, in different directions. This stretching of the nerve seems not infrequently to relieve the pain and hasten recovery. This may be done daily or every second day for some time. Between times the arm should be at rest, until the acute and subacute stages of the inflammation are over.

Dry cupping of the tender nerve, especially as soon as the acute stage is over, is at times of benefit.

Either the d'Arsonval or the Oudin form of high frequency current has been recommended for brachial neuritis, and sometimes lessens the pain and is of benefit in hastening recovery. The treatment should be applied locally by a glass vacuum electrode, and the electrode should be passed along the whole course of the region of pain for a few minutes at first, and not for more than ten minutes at any one time, at first daily, and later less frequently. So-called diathermy, electrical heat applied deeply, is of great help in quieting and aiding recovery.

In the recurrent deltoid muscle pains, which occur in some persons who have a tendency to malmetabolism of the proteins of meats, the vacuum electrode current will sometimes temporarily eradicate the pains. It may be used on the bare skin or through one layer of clothing.

Whenever vacuum electrodes are used close to the skin, great care must be taken that burns are not caused. If the skin is covered, sometimes the current will be used longer and stronger than is intended, one being better able to observe on the bare skin the effect

of the electric current; but after one or two treatments of a person, the susceptibility of his skin to irritation will be recognized, and the dosage and intensity subsequently modified to fit the individual.

Active massage is also of benefit in these cases, and the same is true of polarization with the constant or galvanic current for a few minutes, one electrode being indefinite, and the other, generally the negative, being active over the muscle for a few minutes.

When all acute symptoms of neuritis have disappeared, or the acute pain and inflammation in a muscle have disappeared, and yet recurrent aches occur, with more or less impaired motility, massage and mechanical vibrations are of value in completing the cure. If there is paresis or semiparalysis of one or more muscles, electric treatments are essential, or if the shoulder joint has become more or less impaired in its motion and function by the long continued inactivity, or adhesions have actually formed from the joint not having been properly used, active breaking up of the adhesions must be done. If too painful, this may be done rapidly under anesthesia; or less active, but repeated passive motion of this joint must be caused, tending to gain increased motility day by day until the joint becomes normal. The patient should also daily use the arm to a certain extent and then rest it, if necessary in a sling, for the remainder of the day, until he is able to use the arm for his duties without causing continued pain afterward.

### PAINFUL FEET

This troublesome subject has been discussed by many writers as a separate disease condition. Of all the orthopedic ailments affecting mankind, it is perhaps most usual for him to suffer with painful, aching feet. Frauenthal has suggested that when the pain comes on acutely it is due either to an injury or to an infection; when the pain comes on gradually, there is some relaxation of ligaments or supporting structures. He deplors the promiscuous use of foot plates, some of these metal supports doing more harm than good. A proper fitting shoe is the first essential to comfort of the foot. An arch may not be broken or may not have fallen, and may not need a support. All

it needs is a proper adjustment of the heel to the foot tread and a proper arch to the shoe. Also, pain in the forward part of the foot is often not caused by a weakened arch, and an arch support will not correct pain in other weakened joints or ligaments. On the other hand, when the arch has fallen or has become weak, and there is a rotation of the ankle inward, besides a proper fitting shoe a plate or support that fits the foot and corrects the deformity may and will often entirely relieve the pain in the foot and the associated pain of the leg and back. Various exercises of the foot muscles may strengthen the arch and later allow of the removal of this artificial support.

Another frequently overlooked cause of sore feet and pain and tenderness of the ball of the foot is the modern craze for dancing. A few anatomists call attention to sesamoid bones as being normal in this region of the foot and especially likely to be present at the metatarsophalangeal joint of the great toe, namely, the ball of the foot.

By a series of roentgenograms of normal feet and feet that are painful in this region, Barnes has found that the sesamoid bone is part of Nature's method of protecting this joint and causing normal tread and normal support. He also finds that this sesamoid bone may be fractured or may become injured and not only cause pain from its own disturbance, but cause pain in the joint above it. He orders shoes made with a depression in this region of the sole, and causes comfort, and cures his patients of their disability. In acute injuries of this region nothing will be of so much benefit as rest.

At times irritation or injury may cause an exostosis to occur in this region, which of course can be cured only by surgery.

### BACKACHE

The therapy of backache may belong to the domain of the neurologist, the surgeon, the gynecologist or the genito-urinologist. Backache is a common symptom of innumerable disorders. It can be treated rationally only after the correct diagnosis is made. Unless this is done, any improvement resulting from the treatment is similar to that following any hit-or-miss therapeutics.



## DEFINITION

By backache is usually meant lumbar pain beginning at the region of the first lumbar vertebra and extending downward, often to the sacral and coccygeal regions. The pain may be in the center of the back, along the spine, or on either one or both sides of the spine.

## ETIOLOGY

Often the clue to the real cause of the pain may be obtained by careful questioning. The duration and nature of the pain, its exact location, whether in the center or to one or both sides of the spine, are all of importance. It is essential to know whether or not the pain is associated with fever; has followed a convalescence from some infection; is associated with pain on urination or with changes in the appearance of the urine; has followed a sudden strain; is aggravated by bending the body in any direction, or has any relationship to menstrual or uterine disturbances.

After a careful history of the patient has been recorded, a thorough physical examination is essential in the search for the etiologic factor in the backache. On account of the large number of varied causes, treatment without examination is generally guesswork. The best way to examine the patient is to remove his clothing, and to observe him first in the standing position, noting whether or not the body is flexed to one side or the other, or more weight is placed on one leg than on the other. The presence of any abnormal curvatures or deformities of the spine, or any enteroptosis should be noted. In palpating, points of tenderness should be sought over the spinous processes of the vertebrae, and the presence of ptosed or enlarged abdominal organs should be noted. In women a vaginal examination is essential for the detection of any abnormal uterine conditions, such as marked retroversion or tumors of the uterus, or any pelvic exudates or abnormalities. The patient should flex the body in various directions while in a standing position and should be requested to flex and extend the thighs on the abdomen while lying on the back, that the freedom of these motions and the amount of pain they cause may be noted.

Roentgen-ray examination of the spine will often be of service in revealing thickening or ankylosis of the vertebral joints or rarefaction of the bodies of the vertebrae. It will also aid in helping to exclude renal or ureteral calculi. Finally, the temperature and urinary findings may aid in deciding the cause of the trouble.

#### BACKACHE DUE TO STRAIN OR LACK OF BALANCE

By far the greatest number of backaches belong to the fatigue and lack of balance group. This group has been described by Reynolds and Lovett as due to loss of balance, when an unusual strain is placed on the lumbosacral tissues and the muscles of this region. The strain may be produced by posture, by poor muscular balance and by abnormal conditions within the abdomen, such as enlargement of the organs, enteroposis and obesity. The fatigue may result from an attitude constantly assumed in some form of occupation, such as stooping or bending, or by lifting heavy objects.

Those backaches resulting from changes in muscular balance due to uncorrected broken or fallen arches of the feet, or to the continuous use of poorly fitting shoes, are also placed in this group. The pain in these cases often extends up the lower extremities to the back. From a faulty tread, the muscles of the leg, thigh and lower part of the body may be strained and become painful, and even the knee joint or hip joint may be strained by the lack of balance. A careful examination of the shoes, feet, and posture on standing and walking, and an investigation of the kind of work or the kind of strain to which the patient is subjected, will generally disclose the physical cause and the consequent treatment of this kind of backache.

As a result of the constant backache or frequent attacks of backache, there may come a time when, in the highly neurotic individual, the mind is frequently concentrated on the back, and as a result pains will be present without any cause. Associated with this may be other symptoms, such as perverted heat and cold sensations, an abnormal state of the reflexes indicating a neurasthenic tendency. This con-

dition has been termed "hysterical spine" or, after railway accidents, "railway spine."

The treatment of this form of backache will tax the energies of the therapist. No definite rules can be laid down, except that all other possible causes of the backache must be excluded before a diagnosis of hysterical or railway spine is made. In these cases, treatment should be mainly general, and should be based on efforts to relieve and cure the neurotic condition of the patient. Local treatment is generally only of psychic value, but for that reason alone is essential. In local treatment, use may be made of electricity, diathermy, vibrations, electric light heat, spinal douches, or other hydrotherapeutic measures, and even at times the thermocautery will be found of value. Hypodermic injections of water into the painful regions may be efficient. The general treatment calls for increased feeding, general massage, and regulated exercise, with periods of rest. Occasionally, tonics may be indicated.

#### BACKACHE DUE TO INFLAMMATION OF NERVES

To this type of backache belong those due to affections of the nerves or to affections of the posterior nerve roots with their nerves. This includes neuritis, simple or part of a multiple neuritis, resulting from alcoholism, lead or diabetes. Removal and elimination from the system of the alcohol or lead is the first aim of treatment in the first two instances, and the pain will be ameliorated by proper diet in the case of diabetic neuritis.

The acute pain of the neuritis must be stopped, and if local sedatives, as heat, rest and support by straps or otherwise, do not give immediate relief, a drug sedative must be given, with the full recognition of the probable prolonged or recurrent backache being likely to cause repeated need for the narcotic, and hence the danger of the formation of a drug habit. Occasionally the pain is so severe that morphin with atropin must be given; the latter dulls the endings of the peripheral nerves. If the pain is not so severe, or if it is modified by one or two hypodermics, then large doses of sodium salicylate may be tried, as 1 gm. once in four hours for a few doses. In some instances large

doses of quinin may be efficient, as 0.4 gm. three times a day for a few doses. If either a salicylic preparation or quinin is pushed to physiologic effect, a bromid should be given synchronously to prevent the uncomfortable salicylism or cinchonism, respectively. Five-tenths gm. of sodium bromid may be given for each gram of salicylic acid, and 1 gm. of sodium bromid for each 0.3 gm. of quinin. When there is insomnia without severe pain, chloral in doses of from 0.5 to 0.6 gm. may be given at bedtime. Sodium diethylbarbiturate (veronal-sodium) in doses of 0.3 gm. may be given for sleep, if there is no severe pain. Locally to the back, gentle high-frequency electric currents may be tried, or the arc lamp treatment, with later dry cupping, and perhaps the thermocautery.

In posterior ganglionitis with herpes, if there is considerable pain, the treatment may be much the same as in simple neuritis. If the pain is not too severe, a narcotic is not needed. Generally rest and soothing powders and absorbent cotton placed over the eruption, with supporting adhesive straps to limit motion, markedly ease the pain.

#### BACKACHE DUE TO INFECTION

A large number of backaches are due to changes in the bodies of the vertebra or in the intervertebral joints. When the joints are involved, the pain may be due to an acute infectious arthritis or to chronic hypertrophic arthritis (ostearthritis). These are both associated with a primary focus elsewhere; the acute condition may be part of an acute infection, such as acute follicular tonsillitis, tooth infection, pneumonia, gonorrhea or influenza. When these causes are present there will also be symptoms of the primary infection, such as more or less increased temperature. The involved portion of the spine may be exceedingly tender. Generally this kind of backache disappears with the subsidence of the primary infection.

Hypertrophic arthritis (ostearthritis) is a slowly developing process, often lasting several years and resulting in a thickening, and sometimes in a union of the vertebrae and cartilages. It is caused by a constant source of infection, the commonest being



repeated tonsillar infections, pyorrhea alveolaris and chronic gonorrhea. It may be associated with an arthritis deformans of the extremities. The diagnosis is assisted by roentgen examinations of the spine.

The treatment consists in removal of the primary source of infection, if it can be located. Large hypertrophied tonsils should be removed, and alveolar pyorrhea should be treated. An abscess in or around the roots of the teeth should be sought by means of roentgenograms, and if an infected tooth is found it should be removed or properly treated.

If there is any history of a former venereal infection, in the male, a careful examination should be made of the deeper urethra, the prostate and the associated organs, and any part found infected should receive proper treatment. In females pelvic disease, if present, must be removed, if possible.

Vaccines have sometimes been found of value, especially when they have been prepared from organisms isolated from a primary focus. Until the source of infection is eradicated, local treatment of the back is discouraging, although some relief from the pain may be given by applications of heat, counterirritation and strapping.

Two common causes of infection of the bodies of the vertebrae are tuberculosis and typhoid fever. In tuberculosis the backache first manifests itself when the destruction has progressed to such an extent that a gibbus, or bending, of the spine has resulted, and with it pressure on the nerves has occurred. In the treatment of this condition, spinal support and spinal rest, as furnished by a brace or a plaster cast, should be used. Later, after the disease has become quiescent, the destroyed bone tissue may be successfully repaired by plastic bone surgery.

The so-called typhoid spine occasionally develops after convalescence from typhoid fever. The pain is localized, and may become severe. It does not produce angulation and the deformities characteristic of tuberculous involvement of the spine. The spine is rigid and very tender, and there is often more or less fever. The condition is, as a rule, self-limited, and with proper rest and simple local and general measures, usually results in recovery.

## SACRO-ILIAC PAIN

Lumbago, lumbosacral nerve pains, uterine displacements, coccyodynia or coccyalgia, hemorrhoids and bone disease or bone tumors are not now a sufficient diagnosis to account for all the kinds of backache of the lower part of the spine. Orthopedists have long shown that backaches may come from weakness or broken arches of the feet, as suggested above, throwing the whole center of gravity so far off as to cause pain in the muscles of the back in the effort of these muscles to keep the body in proper equilibrium. They are now teaching the practicing physician, the gynecologist and the surgeon that many backaches are due to a relaxation of the sacro-iliac joints, to inflammation in these joints, and sometimes to degeneration of the bones of these joints. This kind of backache occurs most frequently in women.

It was long believed that the sacro-iliac joint was not intended to have much motion. It has been learned, however, that it has a very valuable and necessary function, and when disabled causes symptoms. These joints may suffer from arthritis due to an infection, rheumatic or otherwise. They may be disturbed by faulty posture or position, as suggested above. They often become more or less permanently injured, owing to a relaxation of the ligaments of the joint, often due to long continued lying in bed, whether from a long illness, as typhoid fever, or after surgical operations, or from other illness which means much or continued lying on the back. Consequently, any patient who must be long recumbent must be frequently turned, if possible, and the bed must be flat and must not be allowed to become sunken in the center. Many an otherwise well person has iliosacral and lumbosacral backaches simply because his bed is too soft and the springs have relaxed, and he lies all night as one would in a hammock. Many an instance of this kind of backache will be entirely cured by a stiffening of the springs, or a change of bed.

These joints may be strained by a sudden twist or turn, or by direct injury in this region. Many a lumbosacral backache dates from an operation table, when the patient was long in an obstetric or lithotomy posi-

tion. Great care should always be exercised during these prolonged operations that the legs are occasionally moved and not allowed to hang in a position that is of great disadvantage to the iliosacral joint. Some orthopedists believe that these joints may be injured by lifting a heavy object; others do not believe that they are thus injured. Lovett does not believe that a strain of this joint is thus caused, but considers it always an attitudinal strain due to faulty positions and fatigue. Patients with this kind of backache often hold themselves more or less rigid while walking, thus tiring other muscles. They dislike to jar themselves, and the pain may radiate down the gluteal muscles into the thighs, or there often seems to be an associated sciatic nerve pain. In fact, many a case of sciatica is not benefited until a defective sacro-iliac joint is improved.

A lumbago or pain in the lumbar muscles, that is, a myalgia of the lumbar muscles, will respond readily, as a rule, to a diet without meat or a diet limited to milk and cereals, with plenty of water, and with the administration of alkalies, such as potassium citrate, 2 gm., in wintergreen water, administered three or four times in twenty-four hours, and to massage and local heat. But if the pain is due to a weakening of the sacro-iliac joint, none of these treatments will be curative.

The only treatment which is of any avail in sacro-iliac relaxations or weakened joints is afforded by more or less immobilization by strapping over the sacro-iliac region, unless the patient rests in bed on a stiff mattress. The straps of adhesive plaster may go all the way round the body at the level of the upper part of the ilium, and may cross each other over the sacrum; or they may be run diagonally from just below the brim of the pelvis around and across the back. Each strap should overlap the other from a third to half of its width to cause good firm support. When diagonal straps are used, a firm supporting strap of adhesive should be put all the way round the pelvis.

The straps being of benefit to a person, later a proper kind of corset may be made, in the case of a woman, or a proper kind of supporting belt in the case of a man, for permanent use.

## LUMBAGO

While most of these backaches of the lower part of the spine were long attributed to lumbago or myalgia of the lumbar muscles, we are now learning that only a small proportion of backaches in this region are due to this cause, and Lovett, in a study of eighty-three cases of backache, found only one due to lumbago. As just suggested in discussing the diagnosis of lumbago from sacro-iliac joint pain, the treatment there outlined for lumbago is almost invariably successful. Hot water applications are also of value, and especially hot sitz baths followed by deep massage. If the patient is rheumatic and has had joint pains, the salicylates may be given. Temporary strapping of the back up and down the spine, or in such a way as to relieve the affected muscles, always causes comfort, hastens recovery, and allows the individual to get about sooner than when strapping is not done. Electrical and vibratory treatments, and deep massage, are also of much value.

## BACKACHE DUE TO PELVIC CONDITIONS

Women with disorders of the pelvic organs frequently complain of backache. It is often associated with painful menstruation, and is undoubtedly due to either the increased congestion in the pelvis or to an obstruction to the passage of the blood at the cervix uteri. Retrodisplacement may produce backache in the sacral region, but the amount of displacement is no index to the amount of pain they will suffer. Backache can be absent in marked retroversion, but is likely to be present if there are many adhesions. Cervical erosions and lacerations, inflammation of the uterus and ovaries, and tumors of the uterus and ovaries may all be causes of lumbosacral, but principally sacral, backache.

It is hardly necessary to declare that no lumbosacral backache in a woman should be treated without a careful pelvic examination having been made. A correction of any malconditions found will be the only means of relieving such a backache. However, it should not be forgotten that a patient may have other causes of lumbosacral backache, even if a pelvic disturbance is pres-



ent. Consequently, the same physical examination of the feet, legs and back should be made as though no pelvic disturbance were present.

#### BACKACHE DUE TO ABDOMINAL CONDITIONS

Pathologic conditions of the kidney may cause pain to be referred to the lumbar region. The most frequent kidney causes are calculi, pyonephrosis, perinephritic abscess, new growths and floating kidney. While many floating kidneys cause no symptoms, sometimes a kidney that is only slightly loose may cause distinct symptoms and pain referred to the back. Examinations of the urine, especially when obtained by catheterization of the ureters, will reveal the presence or absence of pus, and generally of a calculus, and roentgenoscopy will almost always clear up the calculus question. If a calculus is present in the pelvis of the kidney causing backache, pain will also be generally referred down in the direction of the ureter to the bladder, and in the male to the testicle, which immediately shows that the backache is purely secondary to the other condition. A constant study of all the urine passed for a few days, and observation of the temperature, will reveal the presence of pus in the kidney. The treatment of these conditions is, of course, surgical.

A floating kidney causing pain may be kept in position by a proper abdominal belt. If it still causes pain and symptoms, it should be fixed by operation.

A pendent or very obese abdomen may cause the patient so to change his normal posture as to produce backache. Abdominal supports will help in such a case. Ptosed abdominal organs may cause such dragging on ligaments as to give backache; again, abdominal bandages and proper supporting corsets will relieve the strain on the back muscles, allowing the patient to assume a more normal posture while walking and standing.

Impacted feces in the colon, abdominal and rectal growths, and syphilis of the spine are all occasionally causes of backache, and, of course, except in syphilis, treatment of the back is futile.

## NEURASTHENIA

The suggestion that neurasthenia, like hysteria, needed explanation, and that many of the symptoms of this condition could be explained by a subsecretion of the suprarenals was made by Osborne (*Jour. A. M. A.*, March 23, 1901, p. 796) in several discussions on the subject of internal secretions, and was distinctly described by the same author (*Jour. A. M. A.*, Feb. 26, 1910, p. 670) in an article in which he says, "It is possible that neurasthenic conditions and conditions of chronic low blood pressure, without tangible circulatory excuse, may be due to an undersecretion of the suprarenals." It must be allowed that physical tire may cause circulatory weakness and prostration, and that mental tire may cause sleeplessness, loss of appetite, and thus a marked insufficiency in the recuperative power of the body without, perhaps, any special disturbance of any organ or gland. On the other hand, persons who are always neurasthenic, always subnormal, without any special disease, should be subject to classification even more readily than is the neurotic individual. The typical neurotic generally has, if not always, disturbance of the thyroid gland. The typical neurasthenic probably generally has disturbance of the suprarenal gland on the side of insufficiency. The blood pressure in these neurasthenic patients is almost always low for the individuals, and their circulation is poor. Often the activities of the internal organs are impaired, although there may be no discoverable organic disease. Mental exertion, even the simplest, often causes so much weariness and exhaustion as to be prohibitive; that is, such exertion must be forbidden. A vasomotor ataxia, often present, allows chillings, flushings, cold or burning hands and feet, drowsiness when the patient is up, wakefulness on lying down and hence insomnia. The nutrition may be fair or even good, and the weight may be normal. There may be more or less tingling or numbness of the extremities.

There is not much doubt that the cause is disturbance of one or more internal secretions, but just which glands are at fault is difficult to determine.

Testicular and ovarian disturbance, especially on the side of deficiency, are known to cause general depression, hysteria, hypochondriasis, melancholia and disturbances of the digestive secretions. A disturbance of the thyroid secretion may cause in one patient hysteria and in another patient depression; or both conditions may occur in the same patient at different periods. That very large mammary glands, in women who are not pregnant and who are not lactating, may disturb the system has not yet been proved. Many girls and women, however, who are not well and strong, whose flesh is flabby, who may either be overweight or underweight, and who have the mammary glands excessively large, may be disturbed by an internal secretion of which we as yet know little. Pituitary disturbance may affect the cerebral activity.

Many of the symptoms of physical and mental tire, with low blood pressure, especially if accompanied by increased pigmentation anywhere on the skin, may be due to insufficiency of the suprarenals.

Williams (*Jour. A. M. A.*, Dec. 19, 1914, p 2203) comes to the conclusion that many patients who present the well known symptoms termed "neurasthenia" with low blood pressure, with loss of mental elasticity, with both mental and physical depression, with the fear that they cannot now accomplish their usual good mental work, with the story that they have "lost their nerve," in the phraseology of the times, with the fearfulness of making wrong decisions, and with a vacillating and indecisive frame of mind, are many times suffering from an insufficiency of the suprarenals. He finds, as other clinicians have, that the administration of the dried suprarenal gland, in tablets of from 2 to 4 grains, two or three times a day, has caused improvement in many cases.

Any sensible suggestion is worthy of trial in this troublesome neurasthenia, especially as such patients readily acquire the sanatorium habit and become more depressed. Physical and healthy mental exercise is good for these patients. Generally an increased protein diet does them good, as many of them have been, for one reason or another, reducing their meat, fish and egg intake.

Riggs (*Johns Hopkins Hosp. Bull.*, 1916, 24, p. 281) is convinced, and he is right, that in these cases prolonged rest has done more harm than good. Riggs believes that neurasthenia is primarily a mental disorder; that the disorder, in nearly all cases, is originally independent of any and all bodily conditions, and that it exists, in spite of a structurally normal central nervous system. To all intents and purposes, then, the neurasthenic is an originally normal individual. He is sound of mind and body, but this normal apparatus of his gets out of working order because it is unskillfully used, and, therefore, gets out of internal adjustment, and also out of adjustment with what should be its work. Were neurasthenia exhaustion, rest would cure it: it does not. Were it an inherent weakness of the organism, not a single case could be cured: many cases are cured. Were it due to physical disorders, then physical treatment of these disorders would cure it. The conclusion seems clear that neurasthenia is not weakness nor exhaustion; that it is neither a malady of the intestines, the heart, the stomach, nor a disorder dependent on structural change of the nervous system; and that it, therefore, cannot be cured by rest or by any other physical means. He would rely primarily on psychotherapy and reeducation. Occupation plays a large part and the patient's work must interest and please him. This whole discussion seems to show that the trouble is with the endocrine glands.

It should be urged that for the supposed suprarenal insufficiency it is not sufficient to give the blood-pressure-raising substance of the suprarenals, but the whole gland must be fed. Just how much valuable activity is absorbed from the suprarenals when fed has not been determined. Cases are on record in which feeding of this gland has seemed to cure or cause an amelioration of the symptoms of Addison's disease. Williams in many instances has found the blood pressure raised by the administration of this glandular substance by the mouth.

As the posterior lobe of the pituitary gland has been found to furnish a stimulant to the suprarenals, it might be well to consider administering a small dose of this gland in conditions of subsecretion of the



suprarenals, especially as this part of the pituitary furnishes a vasopressor substance.

As yet we have not sufficiently recognized the fact that all of the internal secreting glands may be subject to the same conditions of hypersecreting and undersecreting which are so well recognized as occurring in the thyroid gland. It is quite probable that some unexplained cases of hypertension are due to an increased suprarenal secretion, and it certainly seems more than likely that the condition of chronic hypotension is due to a subsecretion of the suprarenals.

# ACUTE INTOXICATIONS

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## DRUG ADDICTIONS

The Harrison antinarcotic law, which became effective March 1, 1915, deprived many addicts of their drug and caused considerable suffering. Numerous methods have been devised to wean patients from the drug habit.

### OBJECTS OF TREATMENT

1. To stop the drug.
2. To prevent pain and cause sleep.
3. To increase all secretions.
4. To sustain the strength.
5. To support the heart.
6. To teach self-control.
7. To promote nutrition and general health.

These are the main objects that one must keep in mind, and they also represent some of the difficulties in the cure of the morphin habit.

The treatment of an individual addicted to the use of opium or morphin should not be attempted unless the physician is certain that the patient is absolutely under his care and that his directions will be carried out in the minutest detail. With a reliable nurse, treatment may be attempted in a patient's home, but it is not often advisable. If a patient is to be treated at home, the physician should remember that he may become delirious, not only from the withdrawal of the morphin, but from any one of the atropin treatments, and that he might injure himself, or might jump out of a window in order to escape and obtain, if possible, what he thinks he needs. Also, the convalescence of these patients, like hysteria, is better treated at an institution. In fact, it should be stated that generally better results are obtained in an institution for the treatment of this habit, or in a public or private hospital. The physician should exercise the greatest patience, and should show that he has sympathy for his patient during his mental and physical trial. At the same time the physician should be firm in carrying out

the details of the treatment. He should also in every way encourage the patient to exercise his own will-power in controlling the symptoms, and later in refraining from the use of the drug.

#### THE LAMBERT-TOWNE METHOD

The Lambert (sometimes referred to as the Lambert-Towne) method of elimination and rapid withdrawal has proved quite satisfactory. While not strictly a cure for drug habits, it is intended to obliterate the terrible craving which these patients suffer when deprived of their accustomed drug. Vigorous elimination is the most important feature of the method, and is secured by the administration of compound cathartic pills and blue mass or some other form of mercury. The other essential measure is the persistent use of the following belladonna mixture:

	Gm. or C.c.
℞ Tincturae belladonnae (15 per cent.).....	60
Fluidextracti xanthoxyli.....	
Fluidextracti hyoscyami.....	āā 30

The morphin patient is given five compound cathartic pills and 5 grains of blue mass. If these have not acted in six hours, he is given a saline cathartic. After three or four free movements, he is then given in three divided doses at half-hour intervals, two thirds or three fourths of his total twenty-four hour morphin or opium dose. The drug is given in the way he usually takes it. After the second dose, Lambert cautions the physician to study the patient carefully, as a few patients cannot comfortably take more than this amount, and should not receive the third dose of morphin. Beginning at the same time that the first dose of morphin is given, 6 drops, from a medicine dropper, of the belladonna, xanthoxylum and hyoscyamus mixture above described are given, and this dose is repeated every hour for six hours. At the end of six hours the dose is increased by 2 drops. This belladonna mixture is then continued every hour, day and night, continuously throughout the treatment, increasing 2 drops every six hours until the dose has reached 16 drops; this 16-drop dosage is then continued. The belladonna drops are diminished, or discontinued, at

any time that the patient shows symptoms of belladonna poisoning, which is evidenced by dilated pupils, flushed face, dry throat, or a "peculiar incisive and insistent voice and an insistence on one or two ideas." If the belladonna treatment has been stopped, it is again begun at a reduced dosage as soon as the symptoms have subsided. If there is idiosyncrasy against belladonna, it will be shown in the first six or eight hours, and the dose must then be diminished. If 16 drops, the full dose, given for twelve consecutive hours does not cause dryness of the throat, the dose should be increased to 18, and to 20 drops per hour, and when the throat is dry, the dose should be reduced.

Ten hours after the first dose of morphin, the patient is again given five compound cathartic pills and 5 grains of blue mass. If they do not act in eight hours, a saline cathartic should be given. When the bowels have acted thoroughly, one half of the dose of morphin given at first should be given. As just stated, the belladonna drops are still being continued, and ten hours after the second dose of morphin has been given, that is, about the twenty-eighth hour of the treatment, five more compound cathartic pills are given and 5 grains of blue mass, followed again by a saline if the bowels do not act in eight hours. After the bowels have thoroughly acted from the last dose of cathartics, the third dose of morphin is given, which should be one sixth of the first dose. It is stated that usually this will be the last dose of morphin required.

Ten hours after the third dose of morphin, that is, at about the forty-sixth hour, five compound cathartic pills and 5 grains of blue mass are again given, followed by a saline if needed, and at this time, if not before, a bilious green stool should appear. When this appears, usually about eighteen hours after the third dose of morphin or about the fifty-sixth hour of treatment, 2 ounces of castor oil are given to clean out the intestine. Sometimes, Lambert states, it is necessary to continue the belladonna mixture over one or two more cathartic periods before giving the oil.

During the last bowel-moving period the patients are the most uncomfortable, and their excessive nervousness and discomfort may be controlled by codein,



which can be given hypodermically in 5-grain doses and repeated, if necessary, or some other sedative drug, not an opiate, may be utilized.

At about the thirtieth hour of treatment, the patient should be stimulated with strychnin or digitalis, or both, every four to six hours. The amount of strychnin is not mentioned; neither is the amount nor the preparation of digitalis. Digitalis should rarely be given at four-hour intervals. This cardiac stimulation is left entirely to the judgment of the physician who is caring for the patient.

It is stated that some patients cannot tolerate the codein, as it causes poisoning, and urticarial rash, etc. Such patients may receive ethyl-morphin hydrochlorid, and Lambert thinks that the latter is twice as strong in its activity as codein, and he thinks the dose should be "2 or 3 grains, or less." The dosage of this drug, according to New and Nonofficial Remedies, is from one-quarter to 1 grain. The codein or dionin, whichever is given, should be stopped as soon as possible after the castor oil has acted, although it may be given during the succeeding twenty-four hours if necessary, but it should not be continued more than forty-eight hours, as they will acquire this habit, or return to the morphin habit.

Joint and other pains, and bone and muscle aches, Lambert says, "can sometimes be relieved by hypodermics of some form of ergot and strychnin, sometimes by massage, sometimes by sodium salicylate, sometimes by a salicylic compound combined with some of the coal-tar products, such as antipyrin or acetphenetidin; and they can always be eased by codein or dionin. The addition of codein to these coal-tar products increases their analgesic effect." Of course, it does; and it would seem almost inexcusable, if morphin is being withdrawn, to continue codein or ethyl-morphin hydrochlorid for more than one or two doses. The choice of these drugs is apparently left to the physician in charge of the patient. It would seem that the more drugs the worse for the patient. All coal-tar products are depressant and are dangerous for a heart, especially after it has been through the trials that it must go through in the two or three days of this treatment.

Insomnia, Lambert says, may be treated sometimes with bromids, sometimes with chloral or some other hypnotic. Veronal, he says, has caused much depression. Any of these hypnotics must cause some depression. He states that as soon as the patient is up and about muscular fatigue caused by regular exercise makes him sleep, and usually such exercise can be taken at the end of a week.

## CRITICISM

The drugs used in this treatment might be severely criticized. There is probably no necessity for both hyoscyamus and belladonna. The xanthoxylum is useless. It is probable that any good purgative could replace the obsolete compound cathartic pills.

## THE PETTEY TREATMENT

Dr. George E. Pettey also causes catharsis, and has the patient drink large amounts of water to dilute the body fluids, and to cause watery movements and a large amount of urine. He gives his patient tub and vapor baths. His cathartic combination is as follows:

	Gm. or C.c.	
R Calomel.....		
Powdered extract of cascara		
sagrada .....each		66 gr. x
Ipecac .....		065 gr. i
Strychnin nitrate.....		015 gr. $\frac{1}{4}$
Atropin sulphate.....	0013	gr. $\frac{1}{50}$
Mix, and make 4 capsules.		

His other medicinal treatment is scopolamin in  $\frac{1}{200}$ -grain doses, spartein sulphate in 2-grain doses, and during the scopolamin treatment 20 grains of sodium thiosulphate every two hours for 24 hours.

On the first day of the treatment the patient may take his usual dose of morphin, but he must go without his dinner and supper. Pettey's cathartic prescription, which contains atropin and strychnin as above described, is divided into four doses and placed in capsules. The patient takes one of these capsules every two hours, beginning at 4 p. m. The following morning he receives no nourishment and no morphin until his bowels have thoroughly moved. To

insure that they do move, about 5 a. m. the next morning he is given one-twentieth grain of strychnin hypodermically (although he already has had one-fourth grain of strychnin since 4 p. m. the day before). Half an hour later he is given two ounces of castor oil or the contents of a bottle of magnesium citrate. Both the strychnin and the oil or saline should be repeated every two hours until the intestinal canal has been thoroughly emptied, and no morphin should be given during this time. [It would certainly seem as though a morphin patient was very tolerant to strychnin, and it may be that he is sustained by this large dose of strychnin during the first period of going without his morphin.]

After the bowels have freely moved, and the craving for morphin becomes insistent, the patient should be given from one half to two thirds of his usual dose of morphin at the same intervals at which he has been accustomed to take the drug. After this free purging he may have plenty of food regularly, provided he eats nothing for six hours before he begins his second purgative treatment, which should be at the end of forty-eight hours from the first. The cathartic capsule should be given in the same way as on the first day. The morphin may be continued in reduced dose, just sufficient to keep the patient comfortable, until the last dose of the cathartic capsule has been given, when it is stopped, and no more opiate should be given. From six to eight hours after the second purgative course has been completed, strychnin hypodermically and the oil or saline should be repeated, as before. As soon as the patient feels the need of the morphin after this second free purging, instead of morphin or an opiate, he is given  $\frac{1}{200}$  grain of scopolamin hypodermically, and this is repeated in thirty minutes. If the patient does not sleep after the second dose, a third may be given in half an hour or an hour, which may be of the same amount, or double the amount, depending on the effect. This large dosage of scopolamin will cause either sleep or a mild intoxication. In either case the patient will not suffer. As soon as he wakes, he is given another  $\frac{1}{200}$  grain of scopolamin, and this atropin intoxication should be repeated, if necessary, to keep the patient free from pain, for from thirty-six to forty-eight hours after it was begun. It should then be stopped. Dur-

ing the scopolamin period and for twenty-four hours afterward, Pettey gives 20-grain doses of sodium thio-sulphate every two hours, which he thinks supplements the effect of the calomel purgative.

Convalescence is established on the fifth to the sixth day, when medication should cease except treatment aimed at improving the general condition of the patient. During the treatment a weakened circulation is treated by Pettey by giving spartein sulphate in doses of 2 grains, every four to six hours.

#### CRITICISM

Here, again, the drugs used are susceptible of criticism.

Pettey's purgative combination consists of calomel, cascara sagrada, ipecac, strychnin and atropin. The action of these drugs is sufficiently understood to require no further elucidation. Ipecac will increase all secretions more or less, perhaps especially the intestinal secretions. The addition of atropin to the purgative prescription might be questioned, except that it is a fact that every successful treatment seems to require something of the atropin series. Also, atropin is known to stop the griping of cathartics by dulling the peripheral nerves and preventing intestinal spasm. On the other hand, the strychnin will increase normal intestinal peristalsis, which in morphin takers has become more or less decreased. The afore-mentioned cathartic is aided later by castor oil or magnesium citrate. This cathartic treatment emphasizes the fact that catharsis is what is needed, and not necessarily any particular one or more cathartic drugs. Scopolamin and strychnin are added to his treatment. Sodium thio-sulphas is largely used externally, rarely internally, and has been used as a food preservative. There is no doubt that some other drug would serve Pettey's purpose as well, especially as this drug has not been shown to have any special beneficial physiologic activity. Spartein is a liquid alkaloid obtained from the broom plant, scoparius, and has been used in medicine in the form of a crystalline salt, spartein sulphate. It is a nervous depressant, and especially a motor paralyzant. Earlier experimentation seemed to show that spartein



could raise the arterial pressure as well as quicken the pulse rate. Clinically, however, it has been found that in small doses it has little or no action, and in large doses it may cause circulatory depression. It has been largely used in irregular or intermittent heart and in palpitation, but it has not stood careful clinical or hospital tests, and is now very rarely used in cardiac depression.

### JENNINGS' TREATMENT

The treatment of Oscar Jennings consists in giving dionin in place of the morphin, accompanied by spartein sulphate, the doses of dionin being rapidly reduced as conditions warrant. Hygienic measures and good feeding are also employed with vichy, stimulants, cola and other drugs to meet indications. He lays stress on the reeducation of the patient in self-control.

### THE METHOD OF SCELETH

The patient is given a preparatory dose of a saline cathartic. The basis of the medical treatment is the following:

Scopolamin hydrobromid.....	gr. $\frac{1}{100}$
Pilocarpin hydrobromate.....	gr. $\frac{1}{12}$
Ethyl-morphin hydrochlorid—dionin)...	gr. ss
Fluidextract cascara sagrada.....	℥ xv
Alcohol .....	℥ xxxv
Water .....	qs. ad 3 i

Patients treated by this method are first given a saline cathartic, and then the mixture of scopolamin, pilocarpin, ethyl-morphin hydrochlorid and cascara sagrada in the combination described. The dose varies according to the amount of morphin the patient is taking. When more than 10 grains of morphin per day are being taken, Sceleth gives 60 minims every three hours, day and night, for six days. On the seventh day the dose is reduced to 30 minims; on the eighth day to 15 minims, and on the ninth day 15 minims three times a day, instead of every three hours day and night. On the tenth day this treatment is stopped, and strychnin nitrate, one-thirtieth grain three times a day, is substituted. On the eleventh day the strychnin is reduced to one-sixtieth grain three times

a day, and this is continued for a week. During the first five days he gives a very light diet, but liquids freely.

Patients who are taking less than 10 grains of morphin a day start with a dose of 30 minims of the mixture; and if less than 5 grains, 15 minims.

This treatment represents the substitution of ethyl-morphin hydrochlorid for morphin; the fighting of the morphin depression by scopolamin; the necessary promotion of secretions by pilocarpin, and the necessary laxative treatment by cascara. In other words, *this is apparently the simplest and most rational treatment of the three.*

During the first three days of the treatment the patients, of course, are sleepless, and they may vomit; but these symptoms occur with any treatment. If the pulse goes below 40 or above 120 per minute, the scopolamin mixture is stopped, and if there are any signs of collapse, one-half grain of ethyl-morphin hydrochlorid, or one-quarter grain of morphin, is given hypodermically. The same is true of any treatment; if collapse is in evidence, morphin must almost invariably be given.

Sceleth says that in only about 4 per cent. of the cases is there scopolamin delirium, and when such a condition occurs the scopolamin may be omitted from the mixture for a few times and then added in small doses. He further says what is very laudable, namely, to use no other drugs during the treatment. By the fifth day the patient generally has no further desire for his morphin and is ready for food, and may have a ravenous appetite and gain weight rapidly.

Sceleth very wisely says that if the cause that developed the morphin habit is still present, these patients are likely to relapse; if the cause that developed the habit has been removed, the patients are generally permanently cured. Consequently, if the cause that developed the habit has not been removed, it is a subject for the most careful therapeutic and, if necessary, surgical consideration. There certainly is little use in putting a patient through the serious ordeal for the cure of the morphin habit if recurrent severe pain is sure to occur.

The physician is urged to study the action of the drugs employed in the treatment of the morphin habit, and it is recommended that he first try the Sceleth method, which would seem to be the least dangerous, to cause the least hardship, and probably has as good a percentage of cures as any other treatment.

#### CRITICISM

Sceleth combines the laxative cascara sagrada with his scopolamin, pilocarpin and ethyl-morphin hydrochlorid treatment. Pilocarpin is an antagonist to scopolamin, as it promotes all secretions, especially the secretion of the saliva, of the bronchial mucous membrane, and of the sweat. It also acts against the atropin series in causing contraction of the pupils. Unlike the atropins, it is never stimulant, is always depressant, and the secondary effect is that of prostration.

Ethyl-Morphin Hydrochlorid (Dionin) is the hydrochlorid of ethyl ester of morphin, that is, a morphin derivative, and the action is more or less closely like that of morphin, with a possibility that its secondary effects are more depressant. Sceleth in his treatment also uses strychnin.

#### CONCLUSION

These three treatments are all atropin treatments, with free purging, and the more or less gradual withdrawal of the drug, with a subsequent building up of the general system and a development in the patient of self-control.

The drugs used in these systems of treatment are not here criticized from an unfriendly standpoint, but to stimulate, if possible, a more careful study of the condition of morphinism in institutions that do not blindly follow one orthodox method. There is no halo, and there is no zodiacal sign, and there is no one prayer, that necessarily accompanies these particular combinations of drugs. It is largely the forcefulness of the men who carry out the treatment and the persistency in obtaining the object aimed at through some antagonistic drugs, profuse purging, and support of the patient through his trial.

The final results are, of course, dependent on the cause of the addiction. If, since the beginning of the habit, the cause has been removed, the patients are permanently cured and do not return to the habit. Where the cause persists, whether it be functional neurosis, a degenerate mentality or criminality, the patient occasionally returns to be treated anew. No matter what form of treatment is ultimately selected—whether slow or rapid withdrawal—individualization of the patient is of great importance. The assistance of a psychiatrist may be valuable. Above all, institutional treatment should be recommended over attempts at home care.

### LEAD-POISONING

In communities in which there are industrial plants handling lead, poisoning from this source is frequent. It has been shown that the most poisonous or the most soluble forms of lead are not necessarily the most likely to cause accidental poisoning. Those that most readily form dust seem to be most harmful; the more the dust is abolished, therefore, in all forms of lead factories and lead industries, the less poisoning. There is no question, of course, of the danger of lead fumes from molten lead.

In an investigation of this subject Dr. Alice Hamilton (*Jour. A. M. A.*, 1912, Sept. 7, p. 777) concluded that the most poisonous of the lead salts is the suboxid which forms on the surface of melted lead, is given off in fumes at high temperatures and rubs off on the hands of the workers; this salt causes poisoning in smelters, molders, type-setters, plumbers and others. The other forms most likely to cause poisoning are litharge or oxid of lead, and then the higher oxids of lead, as red lead, and the carbonate of lead, or white lead. Those who clean or scrape off lead paint, and also painters, are likely to have poisoning from white lead. Lead-poisoning occurs frequently in factories in which men work in white lead, and in oxid of lead or red lead, and Dr. Hamilton finds that those who work in red lead are poisoned sooner than those who work in white lead.



She believes that a weak sulphuric acid lemonade, which workmen were urged to drink, is not a protective against lead-poisoning. It has been proved that most forms of lead will be so acted on by the gastric juice during digestion that some lead will be absorbed. The only harmless lead seems to be the sulphid of lead.

The amount of lead necessary to cause poisoning varies greatly, probably according to idiosyncrasy—some persons being susceptible, others being tolerant. Some artisans, therefore, may work in lead for years without evidence of poisoning, while others can work but a few weeks before poisoning is apparent. Investigations in some of our factories, Dr. Hamilton says, showed that from 25 to 35 per cent. of the employees had some form of lead-poisoning. Negroes seem more susceptible to lead than white men, and women are probably more susceptible than men. Fatigue, improper housing and insufficient food all render the individual more susceptible to lead-poisoning and its anemia, as we would logically conclude. Those who drink much alcohol are more susceptible to the poisoning, and the tendency to drink beer or whisky in order to remove the sickish, disagreeable, sweet taste from the mouth, due to the lead salts that are inhaled or swallowed, is great with men in these employments. Women, on the other hand, drink a good deal of tea, or crave sour things, to overcome this disagreeable taste.

It has not been shown that lead is positively absorbed from the skin, or that much is absorbed when inhaled into the lungs; probably most of the poisoning is caused by lead being swallowed into the stomach.

The diagnosis of chronic lead-poisoning is sometimes difficult, and for that reason every one should be questioned as to his possible exposure to lead, after other more tangible causes are excluded, if he loses appetite, is pale or anemic, is constipated and suffers from indigestion. These are all prodromal symptoms. The blue line on the gums may or may not be present. If the teeth and mouth are properly cared for the blue line is probably not often found. "The basophilic granulation of the red cells," which was thought at one time to be diagnostic of chronic lead-poisoning, has

been shown not to be pathognomonic. Although lead is usually to be found in the urine of patients who show other signs of lead-poisoning, its absence will not exclude lead-poisoning. The laboratory test is difficult and the specimens should be submitted to experienced laboratory workers for report as to lead content. It has been suggested, in cases in which the patient is working in lead and poisoning is suspected, that a soluble sulphid be rubbed on the skin, on the theory that lead is excreted through the skin, and that if a black precipitate is formed it will show that there is lead in the tissues.

Dr. Hamilton concludes that, although one attack of acute plumbism is not serious and may leave no diseased condition, one attack does predispose to another, and that probably a man who has had one attack of acute colic, for instance, or of wrist-drop, certainly should be ordered to stop working in lead, and that the employer should refuse him employment. The later pathology of chronic lead poisoning becomes that of cardiovascular-renal disease on the one hand, or progressive anemia, weakened muscles (especially the extensors), tremor and emaciation.

In this anemia nucleated red corpuscles are almost always found, even if the anemia is not profound.

Lead colic may occur suddenly, or after protracted constipation, with or without gastro-intestinal pains. During the paroxysm the patient generally vomits, the pulse is slowed and the blood pressure is generally raised. Nothing will stop this kind of pain but large doses of morphin, used in combination with atropin. Hot fomentations to the abdomen should be used or, better, if the patient is able, a hot bath should be taken. As soon as the pain is less severe the patient should receive a saline cathartic, and best perhaps Rochelle salt, as, in spite of the unusual innocuousness of magnesium sulphate, it should not be forgotten that, occasionally, if magnesium sulphate does not cause purging and is absorbed, it can cause nervous depression not dissimilar to that which may occur from lead.

The after-treatment of lead-poisoning of this nature, or if chronic lead-poisoning is diagnosed without lead colic occurring, is a daily morning dose of Rochelle

salt or something similar and the administration of small doses of sodium iodid. The dose of iodid should, as a rule, be small, not more than 0.20 gm. (3 grains) three times a day, after meals, as large doses may cause more lead in the system to become soluble than is desired, and more acute symptoms of lead-poisoning to occur. Anything that builds up the nutrition is also good after-treatment for chronic lead-poisoning; for example, the administration of small doses of iron, and the prevention of high blood pressure and a possible beginning cardiovascular-renal disease.

If lead palsy, which in its most frequent form is wrist-drop, is present, the tonic treatment mentioned before should be carried out with the addition of strychnin and the use of electricity and massage.

Acute cerebral symptoms not infrequently occur. These symptoms may be delirium, epileptiform convulsions, or more or less coma. Occasionally hallucinations and insanity are caused by the action of lead on the brain. These conditions are all exceedingly serious. While wrist-drop is generally curable, more profound paralysis of the arms and legs is much more serious.

Prevention, of course, should be considered by every employer and should be understood by every employee who has anything to do with industries that make or handle lead. A patient who has once been poisoned by lead should either leave his occupation or should inaugurate such means of prevention of future poisoning as are efficient. Personal cleanliness is one of the greatest factors in the prevention of lead-poisoning.

### DELIRIUM TREMENS

In individuals who have habitually used considerable quantities of alcoholic stimulants, even although they may rarely, perhaps never, drink to intoxication, the unfavorable effects of the chronic indulgence in alcohol are frequently seen when acute or chronic illness supervenes. Especially in the severe acute infections, like pneumonia, the symptoms are frequently modified or added to by the effects of the habitual use of alcohol. Alcoholism may imitate many disturbances of the nervous system and it may require the highest acumen of the physician to make a correct diagnosis.

A common characteristic of these cases is the loss of appetite, accompanied often by nausea and vomiting, so that it is difficult for the patient to retain either nourishment or medicine. If the stomach is irritable, it is necessary to give such gastric sedatives as bismuth or bicarbonate of sodium, with such aromatics as capsicum or peppermint. The stomach being in a condition to retain food, abundance of light nourishment should be administered at regular intervals.

#### SEDATIVES

At the first appearance of restlessness and insomnia the patient should be given the bromid of sodium in 1-gm. (15-grain) doses, repeated every two, three, or four hours. In the evening, when it is natural to desire that the patient should sleep, a more active hypnotic should be used. Chloral in a dose of 1 gm. (15 grains), and repeated in one hour if needed, will generally prove effective in securing prolonged sleep, after which the patient's condition will frequently be found very much improved.

Although chloral is undoubtedly the peer of all hypnotic drugs, it is rated as a cardiac and circulatory depressant, and, as is well known, can cause heart failure and death. All hypnotics except morphin, however, in sufficient doses to produce sleep, are cardiac depressants, and it is quite probable that a dose of chloral which is sufficient to produce sleep in a patient with delirium tremens is no more depressant than the dose of other hypnotics sufficient to produce sleep in a patient in the same condition. If the circulation is notably weak, however, other hypnotics may be selected. Paraldehyd has had a long period of approval. Its action is rapid, and many times satisfactory. If the dose is sufficient, there may be considerable circulatory depression for a short time. The various synthetic hypnotics, old and new, sulphonmethane (sulphonal), sulphonethylmethane (trional), diethyl barbituric acid (veronal), and sodium diethylbarbiturate (veronal-sodium), all act more or less satisfactorily, but act much more slowly than do chloral or paraldehyd and, in doses that are sufficient, will produce considerable later depression. A sufficient



dose of scopolamin hydrobromid, hypodermatically, to cause sleep in this excited condition, is likely to cause depression. Also, there often is an increased susceptibility to any atropin or atropin-containing drug, so that the cerebral excitement may be increased by scopolamin.

In cases of acute illness in which, on account of the history of alcoholic addiction, there is reason to believe that symptoms referable to the habitual use of alcohol are liable to supervene, the use of sedatives should be commenced early, before any of the characteristic symptoms of alcoholism appear, and should be continued until it is evident that there is no danger of prolonged insomnia and restlessness.

In severe cases in which active delirium with hallucinations has supervened, energetic treatment is urgently demanded. Danger must be looked for in two or three directions. The circulation is threatened, owing to the weak action of the heart, which may result in edema of the lungs. At the same time the circulation in the brain is especially affected so that there is a passive congestion, with more or less edema. Added to this are the symptoms of exhaustion due to the insomnia and violent muscular agitation. Here there is urgent necessity of maintaining the nutrition of the patient by giving liquid nourishment at regular intervals. It is necessary also to watch the circulation carefully and to maintain the action of the heart. The use of alcoholic stimulants for this purpose, while still recommended by many, is of doubtful propriety at this stage of the disease.

If there is serious cerebral excitement and hypnotics in ordinary doses do not act, a good treatment is ergot, in some reliable aseptic form, injected intramuscularly into the deltoid muscle, a syringe-ful at a dose. One hour after this injection, a hypodermic injection of morphin may be given, not more than  $\frac{1}{4}$  of a grain.

Theoretically morphin is not good treatment when there is cerebral excitement, as the dose required to quiet such excitement is very large, while smaller doses tend to increase the excitement. Under the condition described, however, ergot given first to

relieve congestion of the brain and spinal cord and followed by morphin, prevents the initial excitement of the morphin and projectes the length of time which a given dose of morphin will act, and the outcome is satisfactory.

#### LUMBAR PUNCTURE

The belief is becoming more or less general that one of the important factors in delirium is increased pressure in the cerebrospinal fluid and lumbar puncture will relieve this. Schottmüller and Schumm found a marked elevation in the pressure of this fluid in 80 per cent. of the cases of acute alcoholism examined by them, and in one instance they drew as much as 100 c.c. with no unfavorable reaction. Steinebach found a similar condition in 75 per cent. of patients with alcoholic delirium, and in the remainder there was a relative increase in the pressure of the fluid. That this increased pressure may be responsible for the delirium, and is not merely a condition which accompanies chronic alcoholism, is indicated by the fact that increased pressure is not found in alcoholics before or after an attack of delirium tremens, nor do habitual drinkers who are not suffering from acute alcoholism or who have not had delirium show an increased pressure. Further, if delirium tremens is due to increased pressure, the lowering of the tension by lumbar puncture should cause an improvement in the patient's condition. In this regard Steinebach's results are to the point. In every case the delirium grew milder; frequently it ended entirely. The disorientation as to time and place usually remained for a while. In two instances the delirium returned. Following a second puncture, an increase in the pressure was again found and the delirium soon abated. In the total series of eighteen cases, the average duration of muscular unrest following lumbar puncture was from three to four hours, and of delirium twenty-four hours. In thirty-three cases in which lumbar puncture was not done, the average of the restless days was four, and of the delirium, five days. Thus, through lumbar puncture the duration of delirium was shortened 60 per cent. and the restlessness 75 per cent. This series of cases

was punctured during the first twenty-four hours of delirium. Of the cases that were punctured on the second day following the onset of the delirium, improvement occurred less rapidly. Here the average duration of restlessness was from six to seven hours, of mental confusion twenty-four hours, and of delirium, eighty hours.

The manner of action of lumbar puncture in delirium tremens has been thought to be the same as that described by Quincke for puncture in acute serous meningitis. If the intraventricular pressure reaches a certain point, the usual channels of escape for the spinal fluid become occluded. Then, by lumbar puncture, the hypertension is released and healing begins. Certain facts, however, make another explanation necessary. First, lumbar puncture works equally well in cases which show only a relative increase in pressure; second, Steinebach found that after the withdrawal of the spinal fluid in these cases, the reinjection of from 15 to 20 c.c. of physiologic salt solution gave even more beneficial results. These facts indicate that there is probably some toxic irritant present in the spinal fluid. Accepting this view, the best treatment of delirium tremens is a spinal puncture which releases the pressure and removes part of the toxic substance and a dilution of what remains by the injection of salt solution.

#### CEREBRAL EDEMA

If there are signs of cerebral edema, no treatment is better than, or so satisfactory as, the subcutaneous ergot treatment. The ergot may be repeated in three hours, and then once in six hours for several doses, if it is required. The administration of ergot by the mouth for the action desired on the brain is absolutely unsatisfactory and cannot be relied on. Also, if the heart is weak ergot is the drug indicated.

In other words, if there is apparent edema of the brain, ergot; if there is cerebral excitement and the heart is efficient, chloral; if there is cerebral excitement and the chloral is unsatisfactory alone, add ergot; if there is cerebral excitement and the heart is weak, ergot and morphin.

Strychnin is inadvisable as a stimulant in this condition. A saturated solution of camphor in an aseptic oil may be given hypodermatically, if required, as a quickly acting stimulant. Strophanthin hypodermatically may be given, if deemed advisable. Digitalis, which does not act well for at least twenty hours, is generally not indicated.

In the meantime, while these various dietetic and medicinal measures are being employed, the patient should be kept quiet, should be constantly watched, and should be frequently bathed with warm water, or, if strong enough, given hot baths.

#### HOGAN'S TREATMENT

Hogan (*Jour. A. M. A.*, Dec. 16, 1916, p. 1826) describes the treatment used by him in cases of severe alcoholic delirium, in all of which he has observed a severe acid intoxication, and the effect of the toxins on the nervous system and liver may show anything from simple edema to severe degenerative changes of the fatty type. Any treatment to be of service must be used in the stages of edema, and after experimenting with various salts capable of dehydrating edematous tissues, he has devised a mixture of sodium bromid, sodium chlorid and sodium bicarbonate which can be used in large quantities intravenously, without producing the toxic effect of bromid as ordinarily given in large doses. As the severe types also suffer from a starvation acidosis, glucose in highest concentration is also used intravenously. This not only furnishes an available carbohydrate, readily utilized by the body, but in 30 per cent. concentration produces marked dehydrating effects on the central nervous systems. Sixty-four patients were treated. The mortality was 9.3 per cent., and the average time of detention 2.63 days. The after-treatment followed in all cases consisted of active elimination produced by 0.3 gm. calomel followed by 30 gm. magnesium sulphate. The diet followed the general hospital routine. In his private practice he feeds the patient sugar in large quantities and furnishes alkali to keep down the acid intoxication. "In preparing the solutions 5.8 gm. of chemically pure sodium chlorid and 8.4 gm. of chem-



ically pure sodium bicarbonate are boiled in 120 c.c. of distilled water and filtered through paper, then placed in a flask and reboiled. In addition 10.2 gm. of chemically pure sodium bromid is boiled in 30 c.c. distilled water, filtered and reboiled. These may be kept ready for use and, when needed, added to 850 c.c. of either freshly distilled water or tap water that has been filtered and boiled. Under no circumstances should old distilled water be used, as I have found that it produces severe chills. This mixture is heated to about 110 F. and is ready for use. The glucose used in the early cases was the anhydrous variety, but on account of the price and our inability to procure it in sufficient quantity; I found that I could prepare the glucose crystals found in the market and the results were satisfactory. In a flask with 250 c.c. distilled water 80 gm. are placed and boiled. To this is added 0.25 gm. of charcoal. This is allowed to stand for twenty-four hours, is then filtered into a clean flask, reboiled and is ready for use. This solution may be made and kept ready for use. Both of these solutions must be given very slowly, from twenty to thirty minutes being taken for the 1,250 c.c. A small percolator, such as is used in giving salvarsan, with rubber tubing and needle attached, is all the apparatus that is needed."

### METHYL, WOOD, ALCOHOL POISONING

The Volstead prohibition act, which caused the obtaining of alcohol for beverage purposes to become an exceedingly difficult procedure, undoubtedly led some persons addicted to alcohol to attempt the use of substitutes. Among those most frequently used was the dangerous methyl or wood alcohol. This substance has long been used in the industries and has been a prolific cause of severe and frequently fatal types of poisoning.

#### SYMPTOMS

Among the first symptoms to appear usually are nausea and weakness. There may be associated pain in the back, headache, marked thirst and difficult respiration. Another early symptom is the dimness of vision, which proceeds into the well-known wood-

alcohol blindness. The patients appear cyanotic. The temperature is variable. There may be headache and vertigo, tinnitus aurium, and in severe cases delirium with hallucinations. Ophthalmoscopically there is central scotoma with subsequent findings of optic atrophy. Harrop and Benedict (*Jour. A. M. A.* 74: 25, 1920) found no disturbance of phenolsulphonephthalein excretion or of the normal blood urea concentration, but they did find acidosis of a severe grade to be a prominent factor in the symptomatology. The bicarbonate content of the blood plasma as determined by the Van Slyke method was as low as 36.0 per cent. by volume equivalent to carbon dioxid.

The foremost reason for the unlike physiologic behavior of the two commonest alcohols lies in the unlike readiness with which they are oxidized in the body. Ethyl alcohol may be excreted to a small degree through the eliminatory organs; but for the most part it is burned up much as are the ordinary foodstuffs. Hence the contention that alcohol may be a food. Methyl alcohol, on the other hand, is oxidized with difficulty. More than half of a nontoxic dose may find its way out of the body again through the respiratory channels. Furthermore, the progress of the elimination of the unoxidized portions is comparatively slow, so that the output from a single dose may even continue during an entire week. As a consequence of these features—deficient oxidation and slow elimination—the poison delays in the organism unduly long to continue its detrimental effects.

The fact that a portion of the nervous system—the optic nerve—is especially affected by methyl alcohol naturally suggests that this substance has a preferential affinity for the nervous tissue. Recent researches of Pohl (*Arch. f. Exper. Path. u. Pharmacol.* 83: 204, 1918) at the Pharmacologic Institute of the University of Breslau indicate that this suspicion is not verified. It almost seems, says Pohl, as if no organ retains so little methyl alcohol as does the brain. We must therefore assume that the nervous system is peculiarly sensitive to the toxic agent rather than that it is unduly overwhelmed by larger quantities concentrating in this tissue.

## TREATMENT

The prospect of effective treatment in the case of an agent exhibiting this peculiar behavior is not particularly promising. Pohl found in the case of animals poisoned with wood alcohol that a combination of bloodletting and injection of Ringer's solution seemed to decrease the concentration of the poison in vitally affected tissues. A similar result followed the introduction of charcoal subcutaneously into the body, this substance apparently serving to remove part of the unexcreted alcohol by specifically adsorbing it. Such procedures, interesting as they are in pointing the way to the possibilities of treatment, are far from practicable in the exigencies of human cases.

Based on these studies and on the laboratory findings in cases of wood alcohol poisoning, Harrop and Benedict mention as the two main features of the treatment: gastric lavage during the first three days and correction of the acidosis by intravenous injection of sodium bicarbonate. From 400 c.c. to 500 c.c. of a 5 per cent. solution of sodium bicarbonate may be given intravenously and repeated on succeeding days as the condition of the patient, indicated by the laboratory findings, warrants. Since the methyl alcohol is excreted into the stomach for several days following the appearance of the first symptoms repeated gastric lavage aids in removing some of the poison from the body. The patient should of course be given symptomatic treatment for the relief of pain and delirium and the eyes should have attention by a competent ophthalmologist.

## NITROBENZENE POISONING

This substance, used in the dye industry, in shoe polish, soaps, etc., has also been employed for denaturing alcohol. Many cases have been reported in which persons who had recently worn freshly dyed shoes developed cyanosis, vertigo, headache and tinnitus. The chief symptoms as observed by Stifel, Scott and Hanzlik, and Sanders (*Jour. A. M. A.* 72: 395, 1919; 74: 1000, 1920; 74: 1518, 1920) were caused by the methemoglobinemia. This is manifested by a grayish-blue cyanotic color of the skin and visible mucous

membranes, often with nausea, vomiting, great muscular weakness, marked dyspnea, delirium and convulsive movements. Total unconsciousness and coma may supervene followed by death from respiratory paralysis. The condition is not usually fatal. Of some thirty-six cases recently reported there was but one death, that of a man who drank shoe polish, as reported by Donovan (*Jour. A. M. A.* 74:1647, 1920). The treatment should be symptomatic and supportive.

### ILLUMINATING GAS POISONING

Through the introduction of various forms of gas heaters and special illuminating devices this form of poisoning is becoming more frequent. Suicide by this method is also increasing because of its facility.

Persons poisoned with illuminating gas should receive at once as much fresh air as possible; the tongue should be drawn forward and if respiration is failing artificial respiration should be begun. The use of various devices has been advocated in such cases, and a report on them has been issued by a committee appointed by the American Medical Association and the United States Bureau of Mines. In selecting such a device the possibilities of the machine for harm should be considered. The machine should be investigated as to its capabilities of producing suction, too great inflation, or other injury. Ordinarily the most simple devices or simple methods, like the Sylvester method, will serve. Venesection may be done from one arm, and from "a pint to a pint and a half of blood should be removed," and simultaneously a quart of physiologic saline solution should be transferred into the median basilic or cephalic vein of the opposite arm. Two hours later, if there is not sufficient improvement, venesection may be done again. Saline solutions should be given subcutaneously every two hours in quantities of one pint; or, perhaps better, the saline should be given by the colon by the continuous method.

For stimulation, hypodermic injections of strychnin or camphor in oil may be given; strophanthin may be given; strong coffee may be given by the mouth, if the patient is not totally unconscious. Physiologic saline



solutions may be injected into the rectum by the drip method, or from 300 to 500 c.c. may be given every three hours subcutaneously under the breast. Other substances that can be tried are hypodermic injections of 2 c.c. of ether,  $\frac{1}{100}$  grain of atropin, or 2 minims of epinephrin solution (1:1,000). The body, especially the feet, should be kept warm.

Yandell Henderson (*Jour. A. M. A.*, Aug. 19, 1916) calls attention to the fact that the poisonous effect of the gas is entirely due to its avidity for hemoglobin, with which it forms the same kind of combination as does oxygen, but 250 times as strong. Its poisonous effects seem to be wholly due to the resulting decrease in the oxygen-carrying power of the blood. It is misapprehension, however, to suppose that the compound is permanent or induces any lasting deterioration of the oxygen-carrying power. The combination of the carbon monoxid immediately begins to break up when oxygen can be introduced or the sufferer is carried into the fresh air, if this is done within fifteen or twenty minutes or half an hour. Very often, however, the victim never recovers consciousness and dies a day or two later. Use of bleeding and transfusion is seldom effective and the patient, if he recovers, does so in spite of them. Left to itself, nature does all as far as we now know to stop the sequels of the poison. As a rough estimate, it may be stated that usually a man will die who has breathed 0.2 per cent. of carbon monoxid in normal air for four or five hours, when with from 2 to 5 per cent carbon monoxid, as in coal dust explosion, nearly all the hemoglobin is combined in the first few breaths drawn and death occurs almost as quickly as in drowning. About all that can be done in case of poisoning is to administer artificial respiration when that of the patient has failed, to administer oxygen for half an hour, to keep the patients warm if their temperature has fallen, to supply water to the system, preferably by a Murphy drip, and otherwise give them good nursing and such symptomatic treatment as seems advisable. Henderson adds to these rather negative suggestions one of an experimental character, owing to the resemblance of the coma to that of diabetes indicating an intense

acidosis. Accordingly, in two cases he administered a 3 per cent. solution of sodium bicarbonate intravenously, in one case the total of two quarts given at intervals in two hours and in the other 4 quarts in six. His conclusions are as follows: "1. Carbon monoxid does not form a permanent compound with hemoglobin. Its toxic effects are wholly due to the inability of the blood combined with carbon monoxid to transport oxygen to the tissues. 2. In the presence of excess oxygen, or even of pure air, carbon monoxid is rapidly given off and the oxygen-carrying power of the hemoglobin is restored. 3. The continuance of coma, the subsequent tissue degeneration and death after several days, resulting from carbon monoxid poisoning, are not due to retention of the gas, but are the results of injury to the brain and other organs by the insufficiency of oxygen supplied to them by the blood while the patient was breathing the gas. 4. There is no reason to believe that either bleeding or transfusion of blood are beneficial. They are more likely to be harmful. 5. Fresh air—with oxygen inhalation for a short time as early as possible—symptomatic treatment, and good nursing are the only measures to be recommended. Practically the die is already cast for death, permanent defects, or complete recovery at the moment when the patient is brought out of the asphyxial atmosphere. 6. It is just possible, theoretically, that alkali therapy may be beneficial in combating the acidosis induced by asphyxia."

If the patient survives, the urine should be watched daily for some time, that disturbances of the kidneys may be immediately noted.

In all serious conditions of shock, coma and collapse, while everything that ought to be done should be done, there is a constant tendency to do too much, especially with drugs hypodermatically.

### HEAT PROSTRATION AND SUNSTROKE

It is customary to divide the cases of illness due to excessive exposure to high temperature into two classes: one is distinguished as heat exhaustion; the other as sunstroke, or thermic or heat fever. It is

important to recognize the distinction between these two classes of cases, as their treatment is entirely different.

Heat exhaustion is considered by many as a milder affection, although it frequently results in death. It may occur in those who are not exposed to the direct rays of the sun, but who are engaged in occupations which are accompanied by unusual heat, such as bakers, laundrymen, and foundrymen. It is associated with vasomotor paralysis. The beginning symptoms usually are dizziness, slight headache and throbbing in the head, nausea, and sometimes diarrhea; these symptoms increasing, the patient becomes cold, the skin becomes pale and clammy, great prostration ensues, the patient is restless, and may become unconscious. The temperature is usually subnormal, and is never elevated. The pulse is weak.

#### TREATMENT OF HEAT EXHAUSTION

The treatment of this condition embraces removal of the patient from the influence of the excessive heat to which he has been subjected. If he has been out of doors in the sun, he should be immediately removed to the shade, and as quickly as practicable be taken into a house or a hospital. He should be placed in bed in a room which is cool and well ventilated. The clothing should be loosened so as not to interfere with respiration or circulation, his working clothes should be removed, and hot applications should be placed around his extremities so as to restore the circulation and make him warm. If he is unconscious, so that he cannot swallow, inhalations of ammonia should be given by the nostrils. A mustard paste should be applied to the back of the neck and over the spine; and if the respiration is obviously impaired, a hypodermatic injection of  $1/100$  of a grain of sulphate of atropin should be administered. If the heart is weak, a hypodermatic injection of  $1/30$  of a grain of strychnin sulphate should be given. As soon as the patient is able to swallow, he may be given hot coffee and spirits of camphor, or a hypodermic of caffein. If the circulation is improved, the body becomes warm, and the patient regains consciousness.

In the second class of cases which are termed sunstroke or heat fever, the patient will be found in an entirely different condition. Usually on the arrival of the physician the patient will be found to be exceedingly hot, with a dry skin, a congested face, with veins swollen and arteries throbbing. The patient's temperature will usually be found elevated to from 105 to 110 degrees, or even higher. There is great restlessness; the breathing may be stertorous; the pulse is full and rapid; the pupils, dilated at first, may become contracted, and unconsciousness may rapidly supervene. These symptoms may have come on without very much premonitory warning. They require prompt and active treatment.

#### TREATMENT OF SUNSTROKE

The patient must at once be removed to the shade, and as soon as practicable to a cool and well-ventilated room. His clothing having been removed, and his temperature having been taken, he should, if practicable, be at once placed in a tub of water at a temperature of 80 F., to which ice should be gradually added. At the same time, ice should be applied to the head. While the patient is in the ice-bath, he should be rubbed vigorously to promote the peripheral circulation and bring the hot blood to the surface of the body where it may be cooled. The temperature should be taken in the rectum every fifteen minutes, and as soon as it has fallen to 102 the patient should be removed from the bath; otherwise the temperature may continue to fall until it becomes subnormal, and the patient may pass into a condition of collapse. Ordinarily this bath should not be continued longer than from twenty to forty minutes, but it may be repeated after an interval of two, three or four hours if the temperature should again become elevated. In some of these cases in which it is obvious that a congestion of the internal viscera is embarrassing the action of the heart, venesection may be performed, and a pint of blood may be removed. This loss of liquid from the circulation may subsequently be restored by the injection of physiologic saline solution, if it is deemed advisable.



If there seems to be a tendency to edema and congestion of the lungs, a hypodermic injection of 1/100 of a grain of atropin sulphate should be administered.

If, after the temperature has commenced to fall, the pulse becomes weak, a hypodermic injection of 1/30 of a grain of strychnin sulphate may be administered.

If the elevation of the temperature is not so great, or if the use of the bath is impracticable, the patient may be laid on a cot, over which a rubber blanket has been placed, and a sheet rung out of cold water may be wrapped about him. He may then be rubbed with ice. After the sheet has become warm it may be removed and another one which has been allowed to soak in cold water may be substituted for the first.

Woolley (*New York Med. Jour.*, 1914, 99, p. 1165) believes that to replace the water lost to the body before the attack, and to increase elimination, there is no better method than infusion of saline solutions. If it is true that the oxygen content of the body is low and the acid content high, then such alkaline solutions as those recommended by Fischer are extremely efficacious, whether given by rectum or intravenously, in neutralizing the acids of the body and increasing water elimination by the kidneys. The solution for rectal use he urges should be prepared as follows:

Sodium chlorid.....	30 gm.
Sodium carbonate (crystallized).....	20 gm.
Water .....	1,000 c.c.

The injection should be given slowly enough to allow retention. The time consumed in injecting a liter should not be less than one hour.

For intravenous injection the following solution may be used:

Sodium chlorid.....	14 gm.
Sodium carbonate (crystallized).....	10 gm.
Water .....	1,000 c.c.

This also should be given slowly.

The effect of these solutions on the secretion of urine, Woolley states, is remarkable.

## AFTER EFFECTS

Persons who have been the victims either of heat exhaustion or of heat fever often suffer more or less from the effects of heat during the remainder of their lives. It is always wise to warn patients or their friends of this possibility, and to direct them to avoid, as far as possible, exposure to the direct rays of the sun or to overheated rooms during the summer. They should be advised to practice cold bathing and, if possible, sea bathing during the summer months. Sometimes the administration of tonics, and especially quinin sulphate combined with strychnin sulphate or extract of *nux vomica*, has seemed to aid these persons in withstanding the effect of the summer heat. Persons who seem to be predisposed to be affected by the heat should avoid exposing themselves as much as possible; they should dress lightly, should drink plenty of water, should avoid indulgence in alcoholic drinks, should keep their heads as cool as possible. These precautions may wisely be observed by everyone in hot weather, and especially when an excess of humidity in the atmosphere diminishes the perspiration of those who are working, or are exposed to very hot air.

Some patients who have suffered severe sunstroke find that their memory is greatly impaired afterward, and that they never have the same mental ability and memory. Little can be done to benefit this condition, but if one feels that he should give the patient something in the hope that it may do some good, probably nothing will be more likely to prove beneficial than the glycerophosphate of calcium or some form of phosphorous.

Not infrequently infants and young children suffer from the effects of extreme heat. This condition should be looked for in children who are suddenly taken ill in the hot weather without any apparent reason. If they are found suffering from a high temperature for which no other explanation can be found, and if the history of the case shows that they have been exposed to high temperature, they should be placed under favorable conditions in a cool, airy room, and given a sponge bath of cool water, and cold

drinks should be administered. If the heart becomes weak, tea or coffee, well diluted, may be administered.

Sometimes after exposure to excessive heat there is twitching in the muscles, and even severe convulsions. When the convulsions occur and continue they may be controlled by a hypodermic injection of  $\frac{1}{4}$  grain of morphin with  $\frac{1}{150}$  grain of atropin. If they resist this treatment, the patient may be anesthetized by the administration of chloroform, or a rectal enema containing 2 gm. (30 grains) of bromid of sodium and 1 gm. (15 grains) of hydrated chloral may be administered and repeated, if necessary, after one hour. It may be of advantage to do spinal puncture.

### ASPHYXIA

#### ASPHYXIA FROM SUBMERSION: DROWNING

Most individuals who become asphyxiated from submersion in water or from drowning are dead when they are taken out of the water, and all efforts to restore them to life are futile. This is especially the case if complete submersion has lasted four or five minutes. The occasional instance of the successful treatment of this form of asphyxia, however, makes it incumbent on the physician to be thoroughly informed as to the best methods to employ in the treatment of these cases, and to be prepared to carry them out if he happens to be near when the patient is taken out of the water.

In the first place, the water must be expelled, so far as possible, from the respiratory passages. Probably there is no better way of doing this than by inverting the patient by taking hold of his feet and raising them up and letting his head hang down. This is a simple maneuver, provided the bystanders have strength enough to carry it out. Rolling the patient on a barrel is a crude and harsh substitute. Having removed the water as far as possible from the chest, the next thing to do is to perform artificial respiration. There are a number of methods of doing this.

The so-called method of Marshall Hall was first described in 1858, and consists in rolling the patient alternately from the lateral to the prone position and pressing the back between the shoulder blades when he is in the latter position. This has the advantage that

the tongue does not fall back into the throat and so obstruct the larynx, and the water and mucus readily flow out of the mouth.

The following year the so-called Sylvester method was described. This consists in allowing the patient to lie on his back with his shoulders raised and his head hanging low. The operator then takes hold of the arms of the patient above the elbows and draws them gently away from his body until they arrive at a point above his head. This raises the ribs and increases the capacity of the chest. The arms then are carried down by the side and the elbows flexed and pressed against the lower part of the chest, thus diminishing the capacity of the chest and driving the air out. In this method the tongue is likely to fall back into the throat and interfere with respiration unless some one grasps it and pulls it forward.

In 1868, Dr. B. Howard of New York described a method of treating these cases which consists in laying the patient on his back while the physician kneels over the lower part of the body and presses on the lower part of the chest so as to diminish its capacity. He then relaxes the pressure, and the natural elasticity of the chest increases the air capacity. In this method also the tongue is liable to fall backward, and must be drawn forward. It is objected that in elderly patients the ribs are brittle and may be fractured, and that the liver is congested and may be ruptured.

Finally it remains to describe the method known as that of Professor E. A. Schäfer, professor of physiology in the University of Edinburgh. He recommends that the patient be placed in the prone position. The physician being astride the patient, the open hands are placed on either side of the lower ribs and firm, but not violent pressure is exerted. This may be done by allowing the weight of the body to come on the arms. After this pressure has been exerted for three seconds the body may be brought upward and the pressure relaxed. This should be repeated at intervals of five seconds, or twelve times in a minute.

Schäfer made investigations with a view to comparing the utility of the various methods of artificial respiration. He found that in natural respiration the air



exchanged in a minute by a person breathing thirteen times a minute was 5,850 c.c. The amount of tidal air at each breath, therefore, would be 450 c.c. Employing the Sylvester method, the amount of air exchanged in a minute was 2,280 c.c., showing the tidal air of each breath to be only 175 c.c. With the Marshall Hall method the exchange of air was 3,300 c.c., with a tidal air volume of 254 c.c. With the Howard method the exchange per minute is 4,030 c.c. and the tidal air volume 310 c.c. With his own method he was able to pump through the lungs per minute 6,760 c.c., showing a tidal air volume of 520 c.c. He, therefore, believes that this is the most efficient method of performing artificial respiration. He states that the advantages are: "1, it is fully efficient; 2, it can be performed without fatigue by a single individual; 3, it is simple and easily learned; 4, it allows the tongue to fall forward, and the mucus and water to escape from the mouth, so that the tendency of these to block the passage of air, which is inherent to the supine position, is altogether obviated."

This subject was discussed at considerable length by Professor Schäfer in *The Journal of the American Medical Association*, Sept. 5, 1908, page 801.

In treating these cases it is important to preserve so far as possible the warmth of the patient. Woolen blankets should be obtained, and, after the surface of the body has been thoroughly dried, wrapped about him. While artificial respiration is being employed, friction of the surface of the body, especially from the extremities toward the center, should be carefully but not roughly done. It is recommended that artificial respiration should be continued for from one to two hours, but it seems that there is very little use in continuing efforts to restore respiration after the action of the heart has ceased. As long as the action of the heart continues the artificial respiration should be continued, regularly and systematically.

Some hospitals are establishing apparatus for promoting and compelling respiration in patients who have from ether, chloroform, or other causes, ceased to breathe. In the consideration of gas poisoning it was pointed out that the use of these devices may at times

be attended with danger. In selecting such devices for permanent installation, physicians should advise only those of simple mechanism and guaranteed safety.

### TRINITROTOLUENE POISONING

In ammunition factories, trinitrotoluene, one of the high explosives employed, has been found to be dangerous to the health of a minority of workers coming in contact with it, and has proved fatal from toxic jaundice. The matter has become so important that the medical inspector of factories has prepared for the benefit of practitioners a paper on the chemistry of trinitrotoluene (or T. N. T., as it is designated), its method of absorption, the symptoms produced by it, the precautions to be taken against poisoning, the method of treatment, and the differential diagnosis of trinitrotoluene poisoning from that of dinitrobenzene, tetryl and lyddite, the latter a picric acid derivative.

Trinitrotoluene is a high explosive obtained by nitrating toluene, from coal tar, a benzene compound in which one hydrogen atom is replaced by  $\text{CH}_3$ , and in which during the process of nitrating three other hydrogen atoms are replaced by the nitro radical,  $\text{NO}_2$ . The product is solid at ordinary temperatures and may be reduced to a fine powder, melts at  $80^\circ\text{C}$ ., and sublimates when melted.

When the skin or hair comes in contact with trinitrotoluene, a characteristic yellow or tawny orange stain is produced, which is removable by oils, greases, acetone, ether, benzene and other compounds, but not by water. When trinitrotoluene is treated with alcoholic solution of potassium hydroxid, a deep pink color, changing to purple and then to brown, is produced, and this reaction is employed in testing for trinitrotoluene in urine, after the latter is treated to release the trinitrotoluene from its combinations—a rather complicated procedure.

Trinitrotoluene can be absorbed to a dangerous extent by the skin, and as fine dust or as sublimate will reach the mucous membranes of the nose and mouth, or perhaps even the lungs, and may be swallowed with the secretions of the mouth, nose and throat. It may

be recovered from the feces unchanged in most workers, and in many from the urine, but only in combination. Among the symptoms it produces are dermatitis, much like that produced by other irritants, increased by flushing and perspiration and by friction; gastritis, with abdominal pain, vomiting, constipation which is constant, flatulence and distention; and blood changes similar to those of dinitrobenzene poisoning, with the presence of methemoglobin, though cyanosis and breathlessness are less evident. Cell degeneration is readily produced by trinitrotoluene, and when the liver is involved toxic jaundice results, though in only a few cases. Evidence of gradual absorption is shown by pallor of the face and an ashen gray color of the lips; sometimes the lips and tongue are deeply cyanosed. Jaundice may be conjunctival or general, and often appears suddenly during the first four weeks of exposure. Liver dulness is variable, ascites is sometimes present, respiratory distress is not noticeable when the patient is in bed, and pyrexia has occasionally been observed in severe cases; but neither bradycardia nor pruritus is common. Two deaths from anemia unassociated with jaundice have been reported, with reduction of red cells to one million, of unequal size, but no poikilocytes or nucleated reds. Microscopic examination excluded pernicious anemia. Death resulted from hemolytic aplastic anemia, the blood-forming marrow having been greatly reduced.

Points of differential diagnosis are the characteristic appearance already described, the character and situation of the abdominal pain, and the presence of constipation and abdominal distention. It may be confused with other gastric disturbances, and must be distinguished from tetryl and picric acid poisoning, the former staining the skin a yellow or apricot color, the latter a canary yellow or greenish yellow; both set up a dermatitis similar to that of trinitrotoluene, but the constitutional symptoms are not pronounced, and toxic jaundice from them has not been reported.

Postmortem, the outstanding feature is atrophy of the liver, which in some cases is reduced to half the normal weight. Microscopically, the greater part of the liver tissue is found to have undergone complete destruction, associated with proliferation of fibrous tis-

sue. The kidneys are large and icteric, the cortex bulges, the labyrinths are frequently yellow, there is engorgement of the pyramids, and cloudy swelling and fatty degeneration of the tubules.

Treatment in the absence of jaundice is simple: removal from contact, rest in bed for a day or two, a diet consisting of milk, milk puddings, fruit and green vegetables, demulcent drinks, such as barley water, tea and coffee; for the constipation, vegetable laxatives and cascara, with a mixture containing sodium sulphate, potassium citrate and sodium bicarbonate as a routine measure. In jaundice cases, absolute rest in bed is essential; milk diet, small in quantity at first, gradually increasing to 4 pints a day; the bowels must be kept loose, preferably by a mixture containing magnesium carbonate, magnesium sulphate and peppermint water, repeatedly given. In jaundice with marked toxic symptoms the prognosis is grave. Alkali-producing drugs, such as the citrates and bicarbonates, should be given to overcome the tendency to acid intoxication. Rectal and intravenous saline injections have a place in the treatment of severe cases.

### MERCURIC CHLORID POISONING

The U. S. Hygienic Laboratory collected from Jan. 1 to June 30, 1917, reports of 707 cases of mercurial poisoning, of which sixty-one were fatal. Most of the epidemic of mercurial poisoning dates back to a case which was given considerable attention by the lay press, thus advertising mercuric chlorid as a method of poisoning and making the added unfortunate error of stating that death by this method was painless and easy. Poisoning also occurs not infrequently following the use of mercurial vaginal douches or injections; in some instances there has been a fatal result.

Sansum (*Jour. A. M. A.*, March 23, 1918, p. 824) found that the minimum uniformly lethal intravenous dose of mercuric chlorid in dogs was 4 mg. per kilogram of body weight; a dose which corresponds approximately to the smallest dose of mercuric chlorid which has been known to cause death in man. Such a dose in dogs failed to produce anuria, whereas



this symptom was brought about by the injection of 5 mg. per kilogram.

#### SYMPTOMS.

The first symptoms of mercuric chlorid poisoning are epigastric pain, nausea and vomiting, the vomitus sometimes containing more or less blood. The gastric symptoms may be almost entirely relieved by proper treatment, the success of which depends on the length of time between the ingestion of the poison and the treatment, and on whether the stomach was full or empty when the poison reached it. Diarrhea and signs of duodenal inflammation occur within a few hours, unless the poison was quickly vomited. If much mercury has been absorbed, stomatitis occurs on the second day.

If a tangible amount of mercury has been absorbed, there is soon a gradual diminution in the amount of urine passed, and after the first or second day there may be complete suppression. As noted in other acute metallic poisonings, total suppression of urine may not cause convulsions, as it ordinarily does in uremia, probably because some of the detoxicating functions of the kidneys may still be operative. After several days delirium may occur, followed by coma, while the heart shows gradual failure.

If acute nephritis does not cause death, ulcerative colitis with hemorrhages from the bowels may prove fatal, even after a lapse of several weeks.

#### TREATMENT

The following treatment of mercuric chlorid poisoning is founded on the therapeutic results and laboratory findings of Lambert and Patterson (*Arch. Int. Med.*, November, 1915, p. 865) and of Fantus (*Jour. Lab. and Clin. Med.*, 1916, 1, 879; *ibid*, 1917, 2, 722). It is best immediately to examine the first material expelled from the stomach either by vomiting or by lavage, and to examine the urine for mercury, as the patient may not have taken mercuric chlorid as he imagines. The patient is first given the whites of several eggs and the stomach is then washed out. He is then given a pint of egg albumin water, and the stomach again washed out.

According to Fantus, a tablet composed of sodium phosphite, 0.36 gm., and sodium acetate, 0.24 gm., should be dissolved and administered as soon as possible. If this drug cannot be obtained, the following solution should be substituted: sodium hypophosphite, 1 gm.; hydrogen peroxid, 5 c.c., and water, 10 c.c. If the amount of poison swallowed is known, ten times that amount of hypophosphite should be given. As this dosage of hypophosphite might be large, it should immediately be followed by lavage with warm water and a greatly diluted solution of the antidote. This may be followed by a safe dose of antidote, which may be repeated every eight hours for several days. A glass of egg albumin water should also be imbibed every alternate hour until several doses have been taken. Since it has been shown that milk is worthless as an antidote, there seems to be no necessity for using milk, which curdles and causes acid. As a demulcent, starch water, slippery elm, or flaxseed tea may be used. A gram of sodium acetate, dissolved in sweetened water, should be taken every three hours, for a day or two, being omitted at such times as it comes in conflict with the antidote.

Lambert and Patterson's recommendation of rectal irrigation is important. They use the drop method of rectal irrigation, with a solution of potassium acetate, 4 gm. (a dram) to the pint. It might be well to substitute sodium acetate for the potassium acetate, as in all poisoning and in all serious conditions, sodium salts are safer than potassium salts, as this solution is more or less rapidly absorbed and generally causes diuresis. The colon should also be thoroughly irrigated twice daily to remove whatever mercury may have been there deposited or which may have reached the colon through the bowels. As there occurs a resecretion of mercury into the stomach, it should be washed out twice daily during the first few days unless the patient vomits repeatedly when given warm water. Lambert and Patterson affirm that it is advisable to continue the colonic drip enteroclysis day and night, at short intervals, even though it is intensely disagreeable to the patient until two examinations of the urine on successive days have given a negative test for mer-

cury. They also assert that if excessive doses of mercuric chlorid have been absorbed, or if the kidneys were previously diseased, the treatment should continue for a longer period, as long as three weeks, if necessary.

If the kidneys have become seriously involved and suppression is present when a patient first comes under observation, the prognosis, although very serious, is not hopeless. Lambert and Patterson advise a daily sweat in a hot pack. This treatment, and also frequently repeated stomach washings, depends on the condition of the circulation—if the heart is weak and the circulation poor, the hot pack may be inadvisable.

Wilms and Holm have recommended calcium sulphid as an antidote, Hall has suggested the use of potassium iodid and quinin hydrochlorid, and Weiss, basing his treatment on Fischer's hypothesis, has given the Fischer treatment and combined with it oral administration of "imperial drink" or other mixtures to keep the urine alkaline. MacNider found that the nephritis of mercuric chlorid poisoning was constantly associated with and showed parallelism to the phenomena of acidosis and this he states is an indication for alkaline treatment.

Sansum found that in cases of anuria from experimental mercuric chlorid poisoning, all attempts to reestablish the flow of urine by intravenous administration of strongly diuretic solutions failed. It is his belief that in the reported cured cases a fatal dose was not received because the early treatment prevented absorption of any considerable amount of mercury. The symptoms were those of a relatively mild grade of tissue poisoning, compatible with recovery without accelerated diuresis. "It would appear" he says, "as though the success of the treatment may have been due chiefly to the factors of delayed absorption and hastened elimination from the alimentary tract rather than the diuresis and sweating, although on the basis of the present experiments on dogs, no conclusion could be drawn as to the value of the sweating." In the same way he found that intravenous injections of the sodium acetate sodium phosphite solutions failed to save the lives of dogs poisoned with intravenous injec-

tions of minimum uniformly lethal doses of mercuric chlorid. He concludes finally:

1. There is no sound experimental basis for the belief that the promotion of free diuresis contributes materially to the chances of recovery in mercuric chlorid poisoning, and this phase of treatment should not be permitted to obscure that which is more essential. 2. Combined treatments which involve sweating, diuresis and increased elimination from the bowel probably owe their value chiefly to the latter effort. 3. It would appear in the light of the present study that when 4 mg. or more of mercuric chlorid per kilogram of body weight has entered the tissues at large, death regularly occurs, and that we have no adequate grounds for believing that death is preventable by any known form of treatment. Whereas, subsequent studies may add to our knowledge, it would appear that persons who have recovered from mercuric chlorid poisoning owe their lives to the fact that a lethal dose has never gained access to the extraportal circulation. Practical therapeutic efforts should be directed frankly toward the accomplishment of two things: (a) mechanical removal of the poison from the lumen of the alimentary tract; (b) antidoting the poison before it leaves the portal circuit, that is, particularly before absorption.

However, Sansum's results should not cause the physician confronted with one of these well-nigh hopeless cases to relax his efforts. Everything possible should be done that seems scientifically practical to relieve the various symptoms as they arise.



# DISEASES OF THE EYE

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## OPHTHALMIA NEONATORUM

The prevention of this inflammation of the eye is of national importance and should be understood and carried out by every practitioner who takes charge of obstetric cases. The use of Credé's method has greatly reduced the frequency of this disease, and shown that ophthalmia neonatorum is preventable.

## PROPHYLAXIS

The child's first bath is of the utmost importance. The eyelids must be gently wiped free from the mucus and other matter covering them, a piece of absorbent cotton dipped in boric acid solution serving for this purpose. The head must then be cared for, a soft wash cloth wrung almost dry from warm water being employed. Water should not be poured over the head so that the secretion is washed into the eyes. When the general bath is given the water that is used for the bath must not be used about the head. After thoroughly cleansing the eyes, instill a drop of a 1 per cent. nitrate of silver solution into each eye. While Credé advised the use of a 2 per cent. solution, it is generally believed that the 1 per cent. is of sufficient strength. This may be followed by a little physiologic saline solution or a drop of adrenalin chlorid solution (1:5,000). This "stops the pain and neutralizes the further action of the silver." Other more modern silver preparations have also been advised, as 25 per cent. argyrol or 10 per cent. protargol, but they are probably not so reliable as the silver nitrate.

Special precautions should be taken to prevent infection of those attendant on the patient. The noninfected eye should also be protected by the wearing of a shield. Buller's shield is a watch glass held in place over the eye by the use of adhesive strips and a layer of collodion.

## ACTIVE TREATMENT

If in spite of such prophylactic treatment the conjunctivae become inflamed, they should be thoroughly cleansed. The lid of the eye is gently raised, all pressure being avoided, and the tip of a soft rubber bulb syringe is inserted under the upper lid. Slowly and gently the eye is irrigated with a saturated cold boric acid solution to wash out all purulent matter. This should be done every fifteen minutes if the discharge is profuse, or less often if it is not copious. Mercuric chlorid (1:10,000), normal saline solution, or sterile water may also be used as cleansing agents.

Iced compresses of boric acid solution may be applied to secure lessened inflammation and relief from pain. Continuous refrigeration, however, should be avoided to prevent loss of nutrition which may result from it. If the cornea is involved hot applications and instillation of atropin is generally advised.

In the treatment of these cases silver nitrate is the drug of chief reliance. Once each day during the course, especially while there is a purulent discharge, a 1 or 2 per cent. solution of silver nitrate should be brushed on the everted conjunctiva. If eversion of the lids is extremely painful, they may, at first, simply be raised and the silver nitrate solution applied with a well-protected swab.

The eye is cleaned as often as necessary to keep it reasonably free of pus, be it every twenty minutes or every three hours. The lids are wiped clean and then separated with the fingers; the conjunctival sac is washed out with boric acid squeezed from a pledget of cotton, several drops of one of the milder silver salts are instilled, the excess wiped away, and the lids are liberally smeared with some bland salve, such as boric acid ointment. Injury to the corneal epithelium is most carefully guarded against. In the later stage of the disease, if the conjunctiva becomes boggy and little improvement is taking place, silver nitrate and zinc sulphate are called into use.

Regarding the silver preparation to be used in the acute stages of the disease, a non-irritating drug is indicated; the stronger silver preparations, such as nitrate do good in inflammations by their ability to set

up a reaction and draw in protective substances from the neighboring tissue; and that their place is therefore in those inflammations in which a sufficient reaction does not already exist. This is not the case in gonorrheal ophthalmia, since the reaction is often too great (especially in the adult form) for the conjunctival circulation to take care of.

A number of physicians have reported the successful use of Mercurochrome-220 (N. N. R.). A 2 per cent. solution is freely instilled into the eye. It produces a slight burning effect for a few seconds. It produces a red stain, but will not produce a permanent stain such as is occasionally produced by the silver salts, argyrol and protargol.

If the discharge and inflammation persist, it may be necessary to consider surgical procedures or specific treatment of the complications. The disease is a serious one and the services of a specialist should be procured early in its course.

### BLEPHARITIS

The occurrence of inflammations of the lids has been associated with numerous causes, chiefly general debilitated condition of the body, following infectious diseases, lack of cleanliness and errors of refraction. Bad hygienic surroundings, lack of sleep, irritating atmosphere, due to dust, heat, smoke, or other causes and insufficient light also play a part in some cases.

The correction of these general causes is important, more important perhaps than any local treatment. Local cleanliness and removal of any bad eye-habits should be attempted and persisted in. Errors of refraction should be referred to a competent refractionist for correction. The occupation of the patient as a source of irritation should be thoroughly investigated.

In securing cleanliness of the eyes, the edges of the lids should be washed with soap and water, or water and borax, or solutions of hydrogen peroxid, removing all crusts if possible without serious injury. As a sedative eye wash may be used:

Gm. or C.c.

R	Acidi borici .....	25		gr. v
	Aquae camphorae.....	15	or	fl 3 v
	Aquae destillatae.....q. s. ad	25		fl 3 i

M. Sig.: Place two or three drops in each eye three or four times a day.

Massage of the lids is a therapeutic measure of wide usage in this condition. Among various ointments advised adeps lanæ hydrosus (lanolin) and 2 per cent. yellow oxid of mercury have been commended. Gentle massage by horizontal stroking movements on the closed lids with the index finger, carried from the inner to the outer angle of the palpebral fissure, and lasting from three to five minutes, relieves venous congestion and stimulates the activity of the lymphatics, and absorption of inflammatory products is increased. This ointment, or petrolatum, if preferred, will soften the scales and allow them to be removed, thus aiding in getting rid of the blepharitis. Such massage is best done at bedtime, when some of the ointment may be left on the lids. In the morning the ointment may be washed off, and with it will come many of the scales. The yellow oxid of mercury seems to be a most valuable medication for healing the lesions of this inflammation. It may be ordered as follows:

Gm.

R	Hydrargyri oxidi flavi.....	10		gr. i
	Olei olivæ .....q. s.		or	
	Petrolati .....	10		3 ii

M. Sig.: Apply at bedtime as directed.

This makes 1 per cent. of the yellow oxid of mercury. It should be remembered that the official yellow oxid of mercury ointment is 10 per cent.

When there is much itching of the lids, a salicylic acid ointment may be useful:

Gm.

R	Acidi salicylici .....	15	or	gr. ii
	Adipis lanæ hydrosi.....	10		3 ii

M. Sig.: Apply as directed.

If itching is very marked Brav has recommended a tannic acid ointment, as:

Gm.

R	Acidi tannici .....	15	or	gr. ii
	Petrolati .....	10		3 ii

M. Sig.: Use as directed.



In treating the ulcerative type of blepharitis, or more severe types, it may be necessary to pull out all the eyelashes before undertaking the treatment. The use of silver nitrate is advised in these severe forms, and applications are made once daily with a 1 or 2 per cent. solution. Again it may be said that severe disease of the eyes is best referred to the specialist if competent specialists are available.

### HORDEOLUM (STYE)

The styne is a fairly common form of eye infection. It is ordinarily a staphylococcus infection of a sebaceous follicle, around the lash, but may occur inside the lid as an internal hordeolum or suppurating chalazion.

As the styne is, as has been stated, primarily a staphylococcus infection, its source should be looked for in lowered resistance due to uncleanliness, general debility and errors of refraction.

Attempts may be made to abort the styne by cold applications, but ordinarily when seen it will be too far advanced for such a procedure. As in any other local infection, hot compresses may then be applied and when pus manifests its presence by a yellowish appearance the pus should be evacuated, incising as freely as necessary, and the area may be cleaned up by a mild antiseptic washing.

If the hordeolums occur in crops or tend to recur frequently, general treatment in hygienic matters is indicated, and the use of autogenous vaccines may serve to create a more or less permanent cure with immunity from further attacks.

### IRITIS

Inflammation of the iris may be acute or chronic, primary or secondary in its origin, and associated etiologically with syphilis, rheumatism, tuberculosis, gout, gonorrhea, malaria, diabetes, anemia or any of the acute exanthems. Iritis seldom occurs without a simultaneous inflammation of the ciliary body.

Besides the actual pathologic changes in the iris and neighboring structures there are ordinarily pain, lacrimation, interference with vision and a fear of light. Ordinarily the duration of the disease is from several weeks to several months.

## TREATMENT

In the treatment of iritis both eyes should be placed at rest; smoked glasses may be worn. The patient's general condition should be regulated, constipation prevented and sufficient sleep secured by the administration of hypnotics or morphin if necessary. When the pain subsides the patient should be in the open air as much as possible.

The primary condition associated with the ocular inflammation should be treated energetically. Syphilis, tuberculosis, gout and focal infection are all conditions which demand active scientific treatment. If a focus of infection is found it should be eradicated.

The most important drug in the treatment of iritis is atropin, which should be used in sufficient dosage to produce a full physiologic effect on the pupil. In children it should be used with care to prevent poisoning. In general a 1 per cent. solution may be used, of which one drop is instilled into the eye every hour until the pupil is dilated. Following this one drop every eight hours is used to secure continued action. In children a 0.5 or 0.25 per cent. solution is advisable. When atropin is not well borne and causes unpleasant symptoms, the following solutions may be tried:

Gm. or C.c.

℞ Duboisinae sulphatis .....	1035	or	gr. ½
Aquae destillatae .....	10		℥3 iiss

M. Sig.: One drop instilled in the affected eye every eight hours.

Or:

Gm. or C.c.

℞ Scopolaminae hydrobromidi..	015	or	gr. ¼
Aquae destillatae .....	8		℥3 ii

M. Sig.: One drop instilled into the affected eye three times daily.

If undesirable symptoms from the action of atropin occur, such as very uncomfortable drying of the throat, palpitation, flushing of the face, and cerebral excitation, then the stronger atropins must be discarded and homatropin used.

	Gm. or C.c.	
R Homatropinae hydrobromidi.	40	or gr. vi
Aquae destillatae .....	10	℥3 iiss

M. Sig.: One drop in the affected eye every hour.

[If both eyes are inflamed, the strength of the above preparations, in order for a drop to be used in each eye, must be reduced.]

During the course of the inflammation the tension of the eye must be carefully watched lest glaucoma develop, though a temporary increase in intra-ocular pressure is often seen. As soon as the eye shows increased tension, give absolute rest and stop the atropin. If the tension does not then in a few hours decrease eserine may be used:

	Gm. or C.c.	
R Physostigminae sulphatis...	03	or gr. ½
Aquae destillatae .....	8	℥3 ii

M. Sig.: One drop in the affected eye every hour.

It should seldom be necessary to have recourse to this treatment, and it is rarely necessary to employ surgery to prevent glaucoma from iritis.

The value of atropin in iritis is to dilate the pupil and thus to prevent posterior synechiae. It also contracts the iris, thus reducing congestion, and paralyzes the ciliary muscles, thus giving the iris absolute rest.

If the pain from the inflammation is not stopped by the atropin, hot moist compresses, frequently changed, should be employed. Poultices are not needed. If the deep-seated pain in the orbit continues, so as to prevent sleep, morphin must be used, and best hypodermatically.

Cocain may be combined with atropin at times, as:

	Gm. or C.c.	
R Cocainae hydrochloridi .....	03	
Atropinae sulphatis .....	āā	03 or gr. ss
Aquae destillatae .....	8	℥3 ii

M. Sig.: One drop instilled into the affected eye, every three or four hours, if necessary.

The treatment of hypopyon or posterior synechia is a subject for a specialist.

As it is stated that at least 50 per cent. of iritis is caused by syphilis and that mostly in the secondary stage, constitutional treatment during such iritis is that of the syphilis, and mercury is the important drug.

### BURNS OF THE EYE FROM LIME

This form of accident occurs quite frequently, and is ordinarily followed by very grave results. The most serious and important sequel is the adherence of the lid to the globe (symblepharon) when there are two opposing raw surfaces. If the patient is seen immediately after the accident, the first step in the treatment is to drop into the conjunctival sac a few drops of a 1 per cent. solution of holocain, or of a 4 per cent. solution of cocain, in order to relieve the pain, which is usually intense, and then to remove all the remaining particles of lime as quickly as possible. The irrigating fluid should be a weak solution of vinegar, to neutralize the caustic effect of the lime. Subsequently cold applications should be applied to the closed lids, and a mild antiseptic, such as a 3 per cent. boric acid solution, dropped into the eye every two or three hours. If the burn is at all extensive, the conjunctival sac should be filled with an antiseptic ointment, which not only relieves the pain, but also prevents adhesion of the opposing surfaces. One of the best preparations for this purpose is a mercuric chlorid ointment which consists of mercuric chlorid (1:10,000) in petrolatum. Severe burns from lime, resulting in complete opacity of the cornea, have been treated—in addition to the usual local treatment—by subcutaneous injections of sodium cacodylate (from 1 to 3 grains at a dose) with perfect results.

After emergency treatment has been administered, if the case appears to be at all severe, the patient may well be referred to a specialist in such conditions.

### FLOATING SPOTS—MUSCAE VOLITANTES

The spots floating in the line of vision are not pathologic formations in the vitreous, but are shadows cast on the retina by cells in the vitreous. They have been attributed to irritation of the retina, or congestion of the choroid, as well as to eye strain and to constitutional disturbances. Hyperesthesia of the retina and errors of refraction have also been incriminated as causes of this condition. These spots indicate the need of exam-



ination for errors of refraction and for improving the general condition, otherwise floating spots—*muscae volitantes*—are not of importance. Of course, the vitreous should be examined for the presence of opacities of abnormal character.

# DISEASES OF THE EAR

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## OTITIS MEDIA

All kinds of bacteria may reach the middle ear, but the most frequent infections are the streptococcic and the pneumococcic. In a healthy ear the bacteria reach the tympanic cavity through the eustachian tube, and this presupposes a nasopharyngeal infection and inflammation. Obstruction at the mouths of the eustachian tubes, or swelling in the tubes, then inhibits the normal aeration of the tympanic chamber and predisposes to infection of the middle ear. Hence prophylaxis of middle-ear inflammations consists in the removal of obstructive adenoids in the nasopharynx, in the removal of obstructive hypertrophies of the nasal passages so as to cause proper nasal respiration and the correction, so far as possible, of nasal and nasopharyngeal chronic inflammations.

In acute inflammations of the nose and nasopharynx when the eustachian tubes are likely to become obstructed and bacteria are likely to reach the middle ear, a proper cleansing of the nose and nasopharynx with warm, mildly antiseptic and alkaline sprays and gargles is the proper treatment. Nasal douches as generally applied are likely to force fluid, pus and bacteria into the middle ear, in fact, a douche should never be taken through the nostrils with any but the most gentle pressure. Snuffing mild, warm, alkaline fluids through the nostrils, or gently spraying and then snuffing, or possibly the pouring of such a fluid from a spoon or small vial into the nostrils can do nothing but good and no harm to the eustachian tubes. Or gentle spraying into the nasopharynx with such solutions or gargling and throwing the head forward so that the liquid washes the roof of the pharynx, will also remove products of inflammation, pus and mucus from these parts and from the mouths of the eustachian tubes.

It is important to diagnose infection in the middle ear early in order that mastoid complication be forestalled. As emphasized by La Fétra (*Jour. A. M. A.*

74: 1222, 1920), routine examination of the ears should be made in every child when ill. Complaint of pain in the ear, if present, is of course important; but young infants do not well localize their pains. A baby will cry and put his hand on the abdomen, and complain of pain in the stomach, when examination will reveal a bulging drum as the cause of the pain. Rolling the head or putting the hand to the ear are suggestive, but often have no significance. Absence of any complaint of pain or even of general restlessness is no proof that the ear is not inflamed. Temperature elevation is nearly always present, but this also, like pain, may be absent even when the drum is bulging. Tenderness in front of the ear is a reliable sign, but this, too, is occasionally lacking even when there is high temperature and bulging of the drum. Moreover, many children deny tenderness, in spite of the involuntary wincing of the mouth. Stiffness of the neck is occasionally present even without enlarged lymph nodes under the mastoid muscle and without mastoiditis. La Fétra sums up the indications of middle ear disease by the statement that a bulging drum is the only diagnostic sign. On examination, retraction of the drum and in addition some redness is frequently the first sign of inflammation in the rhinopharynx and often confirms a suspicion of acute rhinitis as cause for fever up to 102 or 103 F. when there is as yet no running or stuffiness of the nose. The next sign of ear involvement is some redness along the malleus, and the next, some fulness and redness of Shrapnell's membrane. These signs are present so commonly with head colds in children, and subside so readily, that this small degree of otitis can be considered a very common accompaniment of acute rhinitis. The next signs that appear mean an otitis media, namely, redness and bulging of the drum membrane, first behind and later in front. Occasionally the drum looks only gray, owing to thickened epithelium, which must be removed to get a view of the drum itself. The retraction meanwhile increases, and the appearance of the drum is that of a small red ring or doughnut. When accompanied by a high temperature, these signs are sufficient justification for incision of the drum; but by far the larger number of such cases

will subside in a day or so if the nostrils are treated by a weak epinephrin solution or if hot irrigations of the ear are employed.

If middle-ear congestion occurs the diagnosis must be made as to whether serum or other fluid is present or not. If fluid is present, as shown by bulging of the tympanic membrane and by deafness, incision of the drum must be immediately made. If no fluid is present in the tympanic cavity, but the drum shows congestion and there is pain, the following ear drops may be used:

	Gm. or C.c.		
R. Acidi borici .....	1	or	gr. xv
Glycerini .....	25		℥ i
Aquae .....q. s. ad	50		℥ ii

M. Sig.: Warm, and pour half a teaspoonful into the ear once in three or four hours.

	Gm. or C.c.		
R. Phenolis .....	1	or	gr. xv
Glycerini .....	25		℥ i

M. Sig.: Warm, and pour several drops into the ear once in three or four hours. Then plug with cotton.

This fluid should be held in the ear a minute or two and then allowed to run out. The outer part of the canal is then gently dried with absorbent cotton and a plug of cotton left in the orifice.

It should again be emphasized that treatment, even as simple as the above, should only be used to relieve congestion and pain, but such temporizing measures should not be used if the drum is bulging and there is fluid in the middle ear. The only treatment for this condition is incision.

La Fétra believes that paracentesis should be done under anesthesia, preferably chloroform, though an exception may be made to this rule if the patient is an infant and only one drum is to be incised. The incision should be a J or U shape, and should be carried well upward. Irrigation with hot boric acid solutions immediately after incision is of advantage, and it is always satisfactory to hear the child gulp or swallow during this irrigation, as this shows a free opening through the drum, with passage of the irrigation fluid into the throat. The temperature, the pain, the tenderness in front of the tragus, and the tenderness of the tip of the



mastoid—if that has been present—should all subside after two or three days. It is quite common, however, for the temperature to remain elevated until the discharge becomes purulent. This may be two or three days after the incision.

Treatment after incision or after perforation of the drum, or of mastoid congestion, and of mastoid inflammation, belongs to the specialist. The restoration of a perfect drum and the recovery of perfect hearing after middle-ear disturbance, and especially after mastoid inflammation, marks a success as great as in any branch of medicine. The general physician's duty ends when he has referred a patient with either acute or chronic ear disturbance to the specialist, and after he has impressed on his patient that the time to prevent, if possible, deafness and the danger of a possible cerebral abscess is now. If the patient neglects his own treatment after warnings, he has only himself to blame, but let him never be allowed the opportunity to blame his physician.

# DISEASES OF THE SKIN

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## PRURITUS: ITCHING

Pruritus, or itching, represents one of the most puzzling problems in medicine. The clinical manifestations are connected with the terminations of the sensory nerves in the epidermis. Many believe that it is associated with hyperemia and inflammation, this condition sometimes resulting in atrophy, with a continuance of itching. There are many reasons for believing that these pathologic conditions are not the ultimate cause of the itching in many cases. For example, *Oxyuris vermicularis*, or pin-worm, causes pruritus in children without any local lesion or disturbance in the nutrition of the skin evident on inspection, and the pruritus is probably not due to the presence of a foreign body on the skin. It is also a question whether the itching produced by pediculi, or lice, is due alone to their presence on the skin in a quiescent state or even in active movement. The rapidity with which the itching in scabies subsides under sulphur treatment indicates that it is due to something besides the presence of a foreign body. Itching produced by a bite of a mosquito is out of all proportion to the local congestion and inflammation and is no doubt due to some poison injected by the mosquito. The itching associated with jaundice dependent on obstruction to the flow of bile into the intestine is due to the irritation of the ends of the sensory nerves by some substance absorbed from the bile into the blood. The itching in urticaria due usually to the ingestion of some unusual article of food, is probably caused by some poison carried to the nerve-endings in the blood as in the case of jaundice.

It will be noted that many diseases accompanied by congestion and inflammation of the skin cause itching, but it is a curious fact that syphilis, which is constantly accompanied by cutaneous lesions, has the striking characteristic that its skin lesions are usually unaccompanied by itching.

With certain general diseases pruritus is a common symptom, especially diabetes and gout. These diseases are all characterized by the presence in the blood of chemical bodies, which are ordinarily not there.

It is taught that pruritus may be of central origin. It is asserted to be of not infrequent occurrence in hypochondriasis and hysteria. Still another form is described as being of psychic origin, and is seen in insane persons who have hallucinations of the presence of parasites, such as pediculi, on the skin; hallucinations which it is often difficult to remove, and which are sometimes removed only after repeated applications of antipruritic remedies.

#### MANAGEMENT

In undertaking the treatment of a case of pruritus it is necessary to investigate every organ of the body so as to restore it to normal action, if possible. First, the condition of the digestive organs must be carefully investigated, and the diet must be carefully regulated. There are two types of people in whom pruritus is seen: one is the stout, robust, plethoric person who is continually overeating, and the other is the thin, hungry person who is continually starving himself. In the case of the former the diet should be cut down. The protein substances should be greatly reduced, and the starches and sugars should be considerably limited. It will be found that certain articles of food are not completely digested but give rise to fermentation; such articles should be reduced to an amount that can be taken care of by the digestive organs. In the latter class, the thin patients, fatty articles of food should be advised, and an adequate amount of protein should be given to afford adequate nourishment. In both classes, fruits, especially oranges and grapes, will be found exceedingly useful.

If the patient is constipated, measures should be taken to make the bowels act regularly and abundantly. A small dose of calomel, several times repeated, is sometimes useful for this purpose. If calomel is thought to be undesirable a saline, as 1 or 2 drams of magnesium sulphate or sodium sulphate, may be given in half a glassful of water in the morning before breakfast.

## ELIMINATION

Pruritus is frequently associated with deficient elimination. If the condition of the urine is found to indicate such defective elimination, the internal use of alkalies will generally be found of advantage. In the case of the plethoric individual with a strongly acid urine of high specific gravity, the following prescription may be used:

	Gm. or C.c.		
R Potassii citratis .....	40		3 ix
Aquae menthae piperitae....	200	or	fl℥ vi

M. Sig.: Two teaspoonfuls, in water, three times a day, after meals.

If the above dose, three times a day, does not alkalinize the urine (if that is the object desired), it may be administered four times a day.

Although it is admitted that pruritus is associated with the sensory nerves, and it is claimed that in some instances it is due to a disturbance of the central nervous system, no drug acting on the brain, spinal cord or nerve trunks is very effective in pruritus, possibly with a single exception of bromids. The continuous treatment of pruritis with bromids is inadvisable. Temporarily such treatment may be used.

## LOCAL APPLICATIONS

Generally, in order to stop the itching, it is necessary to apply some drug to the skin, which will lessen the sensibility of the ends of the nerves which are in trouble. Several drugs are used for this purpose. The most useful are phenol (carbolic acid), menthol, camphor, chloral, thymol, oil of cade, alcohol and alkalies. The following are a few prescriptions which are suggestive. Various modifications of any one of them may act satisfactorily.

	Gm. or C.c.		
R Phenolis .....			
Liquoris potassae .....	5	or	fl℥ iss
Petrolati liquidi.....q. s. ad	50		fl℥ ii

M. Sig.: Use externally as directed.  
Shake.



Or:

	Gm. or C.c.	
℞ Phenolis .....	3	fl℥ i
Glycerini .....	10	or fl℥ iii
Liquoris calcis .....	25	fl℥ i
Aquae .....q. s. ad	100	fl℥ iv

M. Sig.: Sponge over irritated surfaces.  
Shake.

Or,

	Gm. or C.c.	
℞ Phenolis .....	1 0	℥ xv
Zinci oxidi .....		
Amyli pulveris .....		
Calaminae .....ãã	20 0	℥ v
Glycerini .....	10 0	℥ iss
Aquae .....q. s. ad.	180 0	℥ vi

M. Sig.: Sponge over affected area.

Or:

	Gm. or C.c.	
℞ Mentholis .....	50	gr. vii
Sodii bicarbonatis .....	15	or ℥ ss
Glycerini .....	25	fl℥ vi
Aquae.....q. s. ad.	250	fl℥ viii

M. Sig.: Use externally as directed.

Or:

	Gm. or C.c.	
℞ Mentholis .....	50	gr. x
Camphorae .....	1	or gr. xviii
Olei amygdalae dulcis.....	2	℥ xxxv
Adipis lanae hydrosi.....	25	℥ i

M. Sig.: Use externally.

Or:

	Gm. or C.c.	
℞ Camphorae .....		
Chlorali hydrati .....ãã	15	or ℥ ss

M. Sig.: Paint over affected part.

Or:

	Gm. or C.c.	
℞ Mentholis .....	1	gr. xv
Thymolis .....	2	or gr. xxv
Aquae .....	100	fl℥ iii

M. Sig.: Use externally.

Or:

	Gm. or C.c.		
R Camphorae .....	5	or	gr. lxxv
Zinci oxidi .....	15		$\frac{3}{4}$ ss
Cretae preparatae .....	30		$\frac{3}{4}$ i

M. et fac chartulam 1.

Sig.: Use as a dusting powder.

Or:

	Gm. or C.c.		
R Olei cadini .....	5	or	$\frac{1}{2}$ iss
Petrolati .....	50		$\frac{3}{4}$ ii

M. Sig.: Use externally.

Or:

	Gm. or C.c.		
R Olei cadini .....	5	or	$\frac{1}{2}$ iss
Adipis .....			
Adipis lanae hydrosi .....ãã	25		$\frac{3}{4}$ i

M. Sig.: Use externally.

As a lotion the following antipruritic mixture will be found extremely soothing:

	Gm. or C.c.
R Zinci oxidi .....	10
Talci purificati.....	10
Sodii boratis .....	10
Mentholis .....	2
Glycerini .....	10
Aquae calcis .....q. s. ad.	200

M. Sig.: External use.

Shake.

Or:

	Gm. or C.c.		
R Tincturae iodi.....	5	or	$\frac{1}{2}$ iss
Tincturae opii .....ãã	5		
Glycerini .....q. s. ad	25		$\frac{1}{2}$ i

M. Sig.: Paint on externally.

The above prescriptions may be used when only a small part itches, as in chilblain, or something of that description.

Various alcohol and menthol sprays and washes, or simple saline sprays are often satisfactory. The following is a menthol spray:

	Gm. or C.c.		
R Mentholis .....	1		gr. xv
Alcoholis .....	100	or	fl℥ iii
Aquae .....q. s. ad	200		fl℥ vi

M. Sig.: Use externally with an atomizer.

The question of the use of alcohol and tobacco is usually raised in connection with the treatment of pruritus, and it is generally advised that both should be forbidden. Certainly, the vast proportion of people who use tobacco and alcohol are not affected with pruritus. This of course does not indicate that they may not be detrimental to sufferers from pruritus, and possibly in some instances their use aggravates the condition. In such cases their discontinuance should certainly be advised; but in most cases their use or disuse will probably be a matter of indifference.

### PRURITUS ANI

While it is universally insisted that the term "pruritus" should be strictly limited to such itching affections of the skin as are not accompanied by any recognizable lesion, the term "pruritus ani," on the other hand, is used much more broadly, so that under it are commonly included such affections about the anus as are accompanied by itching but do not show any manifest lesion, and also those conditions in which there are decided pathologic changes in the skin and in which intense itching is the most important symptom. Pruritus ani commands the attention and interest of the general practitioner, the proctologist, the dermatologist, and, at times, the neurologist.

### ETIOLOGY

The physician does not do his full duty to his patient, if he prescribes for itching about the anus without making a careful examination of that region and interrogating the patient in regard to his habits and the manner in which the functions of the different organs are performed. It is, ordinarily, a simple matter to determine whether the itching is due to the presence of the *Oxyuris vermicularis* (pin-worm) or to the presence of pediculi. The occasional occurrence of these parasites in this region and their causative

relation to the production of itching should not be overlooked. On local examinations, it is frequently possible to detect the presence of a fissure of the anus, or an ulcer in that situation, or within the sphincter ani muscle. In other cases there may be found a fistula, hemorrhoids, or polypi; and further exploration of the rectum may show a catarrhal condition of the mucous membrane, or a disease of the crypts.

At the beginning of the condition it may be impossible to find any lesion, but, as the case progresses unrelieved, the energetic scratching in order to relieve the itching usually produces a thickening of the skin. Inflammation of the skin occurs, causing an increase of the connective tissue which presses on the nerve endings. This may be followed by an atrophic condition of the superficial layer of the skin. The thickened integument may have a whitish, sodden appearance, and may lie in folds, on or between which there may be fissures caused by the scratching.

Many cases are accompanied by a condition of moisture of the skin about the anus. Some believe that this moisture is the cause of the itching, but it is more probable that in most cases it is an accompaniment of the condition that gives rise to the itching, or may accompany that lesion of the skin which is produced or aggravated by scratching. This moisture is probably due to a hypersecretion of the subcutaneous glands, but it is possible that a part of it comes also from the sweat glands.

In some cases it will be found that a disturbance remote from the local manifestation gives rise to the itching. Congestion of the mucous membrane of the intestine accompanied by a catarrhal condition; congestion of the liver may be accompanied by a congestion about the anus which gives rise to intolerable itching. Pressure on the veins, as from the enlarged uterus during pregnancy, or from pelvic or abdominal tumors, may produce similar effects.

Some general diseases are occasionally accompanied by pruritus ani. The most important of these is diabetes, but the condition may be present in chronic nephritis, in gout, and in rheumatism. It is also a not infrequent accompaniment of the degenerative changes



which accompany old age. Some cases show a decided neurotic element. Sometimes business or professional men who are actively engaged in following their vocation and who are subject to unusual nervous and mental strain are the subjects of this disorder. These various conditions, which do not cover all the causes which have been enumerated as etiologic factors of this itching, indicate that there is a wide scope for the use of judgment in selecting a line of treatment appropriate for each individual case. When this condition is an incident of senility, or of such general diseases as diabetes or nephritis, the treatment is generally palliative, by means of local applications. Of course, any improvement in the diabetes, or in the nephritis, will cause improvement in the local trouble.

#### MANAGEMENT

The dietetic management of the case and the employment of such remedies as promote excretion of the products of metabolism are clearly indicated. In a large number of patients it will be found that a rearrangement of the diet is of great importance. Many of these patients eat too much, and their diet should be restricted so that they eat less and limit the amount of food to the needs of the system.

In many cases there is constipation, accompanied, sometimes, by intestinal fermentation. If this constipation cannot be corrected by a regulation of the diet, some laxative may be necessary. Aloes sometimes seems to do harm by increasing the irritability and congestion about the rectum. Usually cascara or a saline cathartic is preferable. Sometimes it is well to give a moderate dose of cascara at night and follow this by a saline laxative in the morning, regulating the dose so that the patient may have one soft movement after breakfast.

If the urine is highly colored, of high specific gravity, or is strongly acid, the administration of alkalies such as potassium citrate is useful.

Sometimes an operation, perhaps slight or not rarely of considerable gravity, is indicated. If there are tags of hypertrophied skin, they should be snipped off. If there are hemorrhoids they should be removed. If

there is a fissure or ulcer, it must be treated by local application of solutions of nitrate of silver daily, if the solutions are weak (from 1 to 3 per cent.); once in four or five days, if strong (10 per cent.). If there is a fistula, it should be incised or excised. If there is catarrh of the rectum, it may be treated by alkaline enemata.

A considerable number of these patients have been treated with very gratifying results with the roentgen ray. These applications may be given at first with two exposures a week, until some dermatitis is produced, and then once a week. The roentgen ray causes a diminution of the excessive moisture which is sometimes present, and a decrease in the size of the sebaceous follicles, which seem to be affected by the ray more than the sweat glands. Others have used the high-frequency current with asserted advantage.

#### LOCAL REMEDIES

Various local remedies are used with more or less success. A group of suggestive prescriptions will be found above.

Before thinking of applying any remedy, a most scrupulous cleanliness should be exercised. After every movement of the bowels, the anal region should be bathed with hot water, which may be used without medication, or there may be dissolved in it simple salt, borax, or bicarbonate of sodium. The use of newspaper or other coarse paper should be strictly prohibited.

At such times as the itching comes on intensely, especially in the evening or after retiring, local applications either ice-cold or very hot water often afford considerable relief. The hot water may be medicated by the addition of boric acid to the point of saturation, or with borax. Phenol (carbolic acid) may be applied in solution of from 2 to 3 per cent. strength, and it may be used in much stronger solution once or twice a week.

Pusey and Sutton both recommend highly the use of the roentgen ray in intractable cases of pruritus ani, vulvae or scroti. It is applied in moderate dosage at daily or triweekly intervals.

**PRURITUS VULVAE**

All of the general remarks applicable to pruritus ani and perineal pruritus are equally applicable to pruritus vulvae.

An attack of vulvar pruritus accompanying some genital affection is liable to return later, even without any local factor to invite it. Drugs known to have brought on vulvar pruritus in local applications are salol, phenol, mercuric chlorid, and merely too hot and too often repeated water douches, perfumed soaps, toilet waters, etc. Still another and quite frequent cause is the oxyuris. With this there is usually associated anal pruritus. The eggs of the oxyuris may be deposited on the mucosa or skin and cause pruritus. The lesions resemble those of a secondarily infected eczema, and only a microscopic examination will reveal the helminth's ova. Thrush has also been observed as a cause of pruritis in young infants and debilitated elderly women, and in a few pregnant women. A polyp in the urethra, urethritis, calculi in the bladder, herpes, zona, inflammatory processes in the vulva, vagina or uterus or fibromas are also liable to induce pruritis, as likewise diabetes and other constitutional diseases.

The vulvar pruritus in pregnancy, usually disappears after delivery. The women subject to vulvar pruritus at the menopause may be of the gouty temperament or there may be local changes in the vagina setting up the pruritus or nervous disturbances. After exclusion of all other causes, there is left a group of cases with essential pruritus. It is distinguished by its intensity and tenacity. Tentative organotherapy is justified here, trying ovarian, thyroid and pituitary treatment. Vulvar pruritus thus requires general treatment to relieve constitutional disease, to reduce toxemia and reenforce the resisting powers in all ways, studying the inherited predisposition, the environment, the food, the general hygiene, and traumatism. Among the measures that may be required are change of scene, and abstention from coffee, tea, chocolate, sausages, veal, fish and shellfish, cheese, tomatoes, spices, strawberries and gooseberries, cabbage and cauliflower. Hygiene of the digestive tract ranks first in all treat-

ment of pruritus. The teeth should be kept in order; a decayed tooth may keep up a pruritus started by some other cause.

In one-sided, unaccountable and unexplainable pruritus, the Roentgen ray has effected a cure.

### SCABIES

If the burrows and the itch mite are found, of course the diagnosis of scabies is readily made, but there are many cases of itch in which the burrows are difficult of discovery, and the itch mite is elusive and evades the dermal scrapings for microscopic examination. Even the itching varies with different individuals, some few being very tolerant of the irritation and thus becoming conveyors and transmitters of the disease without their personal knowledge.

Various types of skin irritation develop during the several stages of scabitic inflammation. There may be papules, vesicles, pustules and crusts. The severest itching is generally present at night, and especially on first retiring.

"The burrow or run is made by the female in the lower layers of the cornified epithelium of the skin." These burrows, or "roughened, curved furrows," occur most frequently on the anterior surfaces of the wrists and between the fingers. Sometimes these burrows are simulated by dirt-filled lines in the epidermis. The diagnosis can generally then be made by shaving off the suspected epidermis with a scalpel, then laying the epithelial slice on a slide, adding a drop of glycerin, placing a cover glass over it and examining with a low power lens. If the eggs of the itch mite, or the mite itself, are found, the diagnosis is established.

When the fingers and hands do not show signs of this infection, signs may be discovered on the elbow tips, and on the nipples of women. When there is a generalization of the disease, characteristic signs and eruptions will be seen on the hands, wrists, axillary folds, abdomen, nates, in the popliteal spaces, and more or less on the genitals.

It should not be forgotten that the itch may be present in a mixed infection; in other words, there is more or less eczema from the irritations and scratchings,



there may be nodular and suppurative processes, enlarged glands and syphilitic eruptions.

The disease does not seem to be acquired in ordinary social life, but is caught mostly in bed, from individual to individual, or by sleeping in an infested bed.

### TREATMENT

The parasiticides most used in eradicating the itch are sulphur, betanaphthol, balsam of Peru and cresol.

The patient should be instructed to take a hot bath, using plenty of soap and thoroughly cleansing, perhaps with a soft nail brush, the parts where the parasites are mostly located. He should then anoint all parts of his body with the sulphur ointment, and should especially rub it into the parts most affected.

In mild cases of this disease thorough bathing and cleansing of the affected parts with strong alkaline soap, rubbing and dusting the rest of the body with washed sulphur, and then dusting the sheets of the bed with this dry sulphur, may cause an eradication of the disease without the necessity, discomfort and nastiness of ointments.

In more severe cases, sulphur is commonly employed as an ointment, 1 to 2 drams to the ounce, thoroughly rubbed in over the affected parts, the head alone being excepted. The ointment is well rubbed in at night, the patient then donning a suit of woolen underwear which is not changed for from three to five nights, the duration of the treatment. Each night a new supply of ointment is rubbed in. At the end of the treatment the patient may bathe; but no bath need be taken between treatments.

### SULPHUR

The official sulphur ointment contains 15 per cent. of sulphur, and is stronger than should generally be used, on account of the irritation and actual dermatitis that it may cause. Either one of the following may be preferable:

	Gm. or C.c.		
R Sulphuris loti .....	10	or	3 iss
Adipis benzoinati ....q. s. ad	100		3 iii
M. Sig.: Use externally, as directed.			

Or:

	Gm. or C.c.		
R Unguenti sulphuris.....	1		
Adipis benzoinati.....ãã	50	or	3 iss
M. Sig.: Use externally, as directed.			

Or in severe case:

	Gm. or C.c.
R Betanaphthol .....	1
Balsami peruvianaë .....	2
Unguenti sulphuris .....	30
M. Sig.: Use externally, as directed.	

Or for use especially in children:

	Gm. or C.c.		
R Sulphuris sublimatis .....	1		
Balsami peruvianaë .....	2	or	3 ss
Adipis .....	30		3 i

### RINGWORM: TINEA TRICHOPHYTINA

To two very different diseases the name "tinea" has been given: one is tinea favosa, which is caused by the *Achorion schönleini*, the other is tinea trichophytina, which is caused by the vegetable parasitic fungus trichophyton. It is the latter to which the present remarks will be limited.

The effects of this fungus are usually divided into three subdivisions, according to the particular part of the body affected. When that part of the face on which the beard grows is affected, it is distinguished as tinea barbae, or ringworm of the beard, or barber's itch. When the hair of the scalp is affected, it is known as tinea tonsurans, or ringworm of the scalp. When other parts of the body are affected it is known as tinea circinata, or ringworm of the body. These three varieties of the disease are also distinguished respectively as tinea trichophytina barbae, tinea trichophytina capitis, and tinea trichophytina corporis. The same remedies are applicable to the treatment of these three forms of the disease, but the location in which the lesion is found necessitates some difference in their mode of application.

The trichophyton fungus is found and grows in the epidermal layer of the skin. It penetrates into the hair follicles, and also into the root and body of the

hair. Its presence in the latter locations renders the application of drugs for its destruction very difficult, and it is on this account that the affection of the hairy scalp and the beard is especially resistant to treatment.

There are several drugs which are useful in the treatment of the disease when they can be effectively applied. The most important are mercury, iodine, resorcin and chrysarobin. When there are a few spots on the surface of the body, a useful application is the following:

	Gm. or C.c.	
R Hydrargyri chloridi corrosivi	10	gr. ii
Glycerini .....	5	or 3 ii
Aquae .....q. s. ad	50	fl3 ii

M. Sig.: Shake, and rub thoroughly into the lesion, twice a day.

The application of this lotion, or in fact of any remedy, should be preceded by a thorough scrubbing of the affected parts with hot water and soap, preferably soft soap or green soap. When the patient is a young child, care should be exercised not to apply too strong a lotion and not to apply it to too extensive a portion of the body, for too liberal applications of strong mercurial lotions may cause mercurial poisoning.

If one prefers to use an ointment—and ointments are often exceedingly useful because watery preparations do not easily penetrate the skin—an efficient ointment is the official unguentum hydrargyri ammoniati. This ointment is 10 per cent. in strength. If there are many spots of disease, or the skin is tender, it is well to dilute it with an equal part of lard or petroleum fat. as:

	Gm. or C.c.	
R Unguenti hydrargyri ammoniati	15	or 3 ss
Adipis benzoinati .....	15	

M. Sig.: Apply to spots twice a day.

If the condition is chronic, and these washes and lotions do not prove effective, the patches may be painted with tincture of iodine. This may be repeated every day for several days until the inflammation becomes so great that the application causes objectionable discomfort.

Ointments containing chrysarobin or pyrogallol are effective, but should not often be used on account of the fact that they stain the skin and clothing, and sometimes cause considerable inflammation.

In a series of cases successfully treated by Ormsby and Mitchell, the treatment consisted of three preparations. In the severe pyodermic or eczematoid-dermatitis cases, a preliminary soothing treatment of naftalan combined with zinc oxid and starch was used. This was followed by 5 per cent. chrysarobin in traumaticin (chloroform solution of gutta percha) which was painted on until a good reaction occurred. Ordinarily, the chrysarobin in traumaticin was immediately prescribed and direction given for five daily applications. The patient was asked to return for observations after eight days. If necessary, the treatment was repeated. In another series of cases, an ointment recommended by Whitfield was used. This contains 2 parts of salicylic acid and 4 parts of benzoic acid in 30 parts of ointment base. It is applied daily and can be used for several weeks without producing irritation.

Chrysarobin was used alone in thirty-six patients, who made an average number of 3.6 visits. The ointment mentioned above was used alone in eight patients, who made an average number of two visits. The number of cases in which the ointment was used is obviously much too small for comparison, but it appears to be somewhat more efficient than chrysarobin. Pusey has recommended the application of iodine, 2 per cent., in tincture of benzoin and Sequeira has recommended a mixture of 1 dram (4 grams) of resorcin to 1 ounce of the compound tincture of benzoin.

The roentgen ray has been used as a germicidal application, and as a promotor of a mild dermatitis (after a forerunner of a cure) in all parts of the body, and with frequent reports of success. The hair, when the ray is used on hairy parts, falls out, but seems to generally soon return. Such treatments are best administered by an experienced roentgen-ray therapist.

Foley (*Lancet*, Jan. 24, 1914) describes the following method which he believes is extremely effective: the diseased area is first washed with a strong solu-



tion of sodium bicarbonate and swabbed with spirit of ether to remove grease. It is then painted with tincture of iodine and sprayed immediately with ethyl chlorid until the integument gets china white. The deeper the disease process the longer the spray must be applied. In ringworm of the scalp three or four applications may be necessary, but on smooth surfaces one application usually suffices.

Hartzell has also found the ointment suggested by Whitfield, which contain 3 per cent. of salicylic acid with 5 per cent. of benzoic acid, most effective; but, he says, it cannot be used, as Whitfield has pointed out, without some degree of caution in markedly inflammatory cases, as it occasionally produces considerable irritation. The formula for this ointment is:

	Gm. or C.c.	
Benzoic acid .....	2	gr. xxx
Salicylic acid .....	15	gr. xxiv
Linseed oil .....	15	
Lanolin .....	15	āā 3 ss

These cases are often very obstinate, and treatment must sometimes be carried on intermittently, for weeks. It often happens that an apparent cure results while a few of the fungi still remain in the skin without showing any evidence of their presence. Consequently, cases should be kept under observation for some time after cure is apparently complete, and if any evidence of a return of the disease appears, the treatment should be renewed.

This disease appears more frequently in children than in adults, and the growth of the fungus seems to be favored by high temperature and by moisture. The disease is contagious, and is readily passed from one individual to another. Where considerable numbers of people associate intimately together great care should be observed to prevent one contracting the disease from another. The use of combs, brushes, towels and clothing by different individuals should be strictly forbidden, especially when the existence of a single case among a number of children, as for instance in a large family or in a school, is known. It seems likely that with the extension of medical inspection to chil-

dren in the public schools and with sanitary barber shops, this disease will, in a few years, become exceedingly rare.

### TINEA TONSURANS

Ringworm of the scalp or bearded portions of the body is ordinarily a stubborn condition to treat. There are two chief methods used in the treatment — the drug treatment and the roentgen ray.

The roentgen-ray treatment is of material aid in shortening the course of the disease. It produces epilation; it does not seem to kill the fungi but it may stimulate the skin to a healthy inflammatory process that aids in ridding it of the organisms. Such treatments should not, however, be undertaken by those not thoroughly conversant with the action of roentgen rays, as the harm done by incautious use of the apparatus may be irremediable.

The local use of remedies rarely effects a cure of this stubborn condition. The remedies suggested are usually strong antiseptics. The same preparations recommended for ringworm of the body may be utilized. The hair should be cut very short, thoroughly scrubbed and the remedy applied vigorously. Severe cases are best treated by the specialist.

### TINEA CRURIS

This is a disease that frequently attacks in epidemic form the students of universities and preparatory schools. It occurs on the inner side of the thighs near the body, often spreading to the scrotum, to the abdomen, to the perineum, and to the buttocks. The hairs do not fall out, thus differing from the ringworm that attacks the scalp and other parts of the body. There is slight itching and burning, but the disease may go on for weeks and even months without very much disturbance to the patient. The most frequent organism is the *Epidermophyton inguinale*. It does not tend to recovery and will persist until properly treated. In fact, the treatments outlined in most of the books on skin diseases are tediously ineffectual, and the statement is often made that a cure of the disease requires weeks and even months of treatment. Con-

sequently ordinary treatments of this disease are usually unsatisfactory.

The following treatment is one which has been found effectual and curative in a short space of time. It has been successful where some of the milder antiseptic treatments have failed. It must be impressed on the patient that reinfection readily and almost persistently occurs unless the greatest cleanliness of the under-clothing and even trousers is inaugurated. It is evidently transmitted from patient to patient from the closet seats. Dirty jock straps and suspensory bandages used in athletics are persistent transmitters of the disease. Therefore, clean clothing must be worn after all the washable clothing has been boiled and the trousers have been properly cleaned and properly ironed. Closets must be rendered aseptic by frequent corrosive sublimate baths.

#### TREATMENT

The patient should be instructed to come to the office, bringing clean drawers and a clean shirt, so that after the antiseptic treatment he can put on clothing that is not infected. The different steps in the antiseptic process are:

1. The parts are all thoroughly cleansed with a soft brush or cotton, and liquid soap, and the skin for four or five inches distance from the infected areas should also be cleansed with this soap. The scrubbing should not be very severe, as the skin must not be broken and the epidermis not too severely removed.

2. The infected area should then be wiped over thoroughly with a 2.5 per cent. phenol solution. This will slightly anesthetize the parts to which the stronger antiseptic must be applied.

3. A cotton swab is now wet with the official formaldehyd solution. This is then lightly swabbed over all the infected parts, which are kept wet for three minutes, provided the patient can stand the burning pain for this length of time. If there is an area that is especially red and inflamed and sensitive, this part may be swabbed with the next solution mentioned before the three minutes have elapsed.

4. The whole area to which the formaldehyd solution has been applied is now thoroughly washed with the 2.5 per cent. phenol solution. This quickly relieves the pain caused by the formaldehyd application.

5. After the burning pain has ceased, the skin is gently dried and talcum powder is dusted over it. The patient then dresses in his clean clothing and takes care that he does not come in contact with any infected garments, beds or closets.

6. After twenty-four hours the patient should report for observation. If severe irritation has been caused by the formaldehyd solution, a 2 per cent. phenol ointment should be applied. If there is not severe irritation or inflammation, the simple talcum dusting powder is to be freely used.

7. At the end of a week the patient is again examined, and if there are any recurrent small areas, which may happen at the margins of the affected region, these are again touched with the formaldehyd solution.

By the above treatment a cure may be expected immediately and certainly within two weeks. The success of the antiseptic treatment is certainly far in advance of the ordinary treatments of this inveterate disease.

The preparations advised are as follows:

Gm. or C.c.

R Phenolis liquefacti ..... 2|  
Aquae ..... q. s. ad 100|

M. Sig.: 2 per cent. carbolic acid solution.

Gm. or C.c.

R Liquoris formaldehydi ..... 100| or fl̄ iv  
M. Sig.: Official formaldehyd solution.

Gm. or C.c.

R Phenolis liquefacti ..... 50 or m̄ x  
Petrolati ..... 25 | 3 i

M. Sig.: Apply externally as directed.

## IMPETIGO CONTAGIOSA

Pus infection of the skin, usually of the staphylococcic type, is an exceedingly troublesome condition. Crusts should be removed by the application of moist dressings, bathing with warm water, or mild friction



with gauze. In young children, scratching should be prevented by the application of bandages or suitable splints to prevent bending the elbows. Ammoniated mercury ointment is usually recommended for this condition. The official ointment contains 10 parts of white precipitate in 90 parts of benzoinated lard. Sutton has stated that this preparation is too strong for the most effective use and he finds an oily preparation better than a fatty preparation, viz.:

	Gm. or C.c.		
R Hydrargyri ammoniati . . . . .	1	or	gr. xv
Olei olivae . . . . .	100		℥3 iv

M. Sig.: Apply externally as directed.

If deemed advisable, compresses may be soaked in this solution and kept in place over the affected areas by means of bandages or adhesive plaster. In the hairy parts of the body, as in the beard, a continuous application for twenty-four hours of the above solution will loosen all crusts and allow the antiseptic to reach the germs of infection and will inhibit the spreading of the disease.

Morrow (*Jour. A. M. A.*, July 21, 1917, p. 176) treats the areas underlying the crusts by painting with 20 per cent. silver nitrate solution. This, he points out, has the two disadvantages of some painfulness and staining of the skin, but because of the reliability of the method he believes the objections may be disregarded.

New lesions can usually be prevented by washing with boric acid solution, or with a weak solution of mercuric chlorid. Still, the patient should always be examined carefully and often, in order that new lesions may be recognized in their first stages and promptly aborted. A dusting powder, preferably one containing ammoniated mercury in the strength of from 6 to 10 per cent., and boric acid powder up to from 15 to 20 per cent., is applied following the silver. When the impetigo is on the uncovered part, even without the silver the powder form of treatment may be selected in preference to a grease. Adults who have the infection on the face should not shave until all active signs of it have disappeared and they should not subject themselves to the irritation of the wind, such as results from motoring in open cars.

Unna (*Berl. Klin. Wchnschr.*, 1915, lii, p. 453) says: "No true pus coccus affection of the skin, no isolated furuncle, no felon, should be taken lightly. When any of these have lasted any time, true pus cocci are already installed in the neighboring apparently sound hair follicles, ready to start new impetigo or furuncles. They must be walled off from the rest of the skin with a rampart of coccus-destroying substances." For this he uses ichthyol, or an ichthyol or mercury-phenol plaster, or a zinc-sulphur-chalk-turpentine paste. Another formula contains 10 parts sulphur lotum, 10 parts calcium carbonate and 80 parts zinc ointment.

Before applying any of these preparations he washes the lesions and after drying touches them lightly with concentrated phenol on the suppurating points and also the roots of the hair around the spot. In case of extensive pyodermia, all the pustules are opened and the entire body is rubbed long and thoroughly with soap. He states any soap will do except tar soap, which, he thinks, breeds folliculitis. All the pustules, then, and their environment, are covered with zinc paste and gauze as maceration of the skin from friction of any kind promotes spreading of the impetigo.

### PSORIASIS

The cause of psoriasis has been variously attributed to an infectious nature, to errors in metabolism, to disease of the glands of internal secretion. An inherited tendency seems evident in 5 or 6 per cent. of the cases, and anything causing internal disturbances is liable to aggravate the condition or bring on attacks, especially digestive disturbances, abuse of coffee, tobacco or alcohol, a diet too rich in albumin, or constitutional disease. When diabetes and glycosuria can be excluded, benefit is often derived from a vegetarian diet. It is doubtful if any of the theories as to the cause of psoriasis is supported by conclusive evidence.

### TREATMENT

In treating psoriasis, various new methods have been proposed and tried more or less in the last few years, but none of them has proved of great value. In general, chrysarobin ointment still remains the most

effective remedy for cleaning up psoriasis. The custom today is to use it in rather dilute strengths—from 2 to 5 per cent. chrysarobin in some ointment base. The lesions can often be cleaned up with Roentgen rays, but the method is not to be recommended unless used with great caution. As a rule, the eruption recurs after Roentgen-ray treatment, as after all other methods of treatment. Another recent method of treatment is exposure to highly actinic rays of light. Sometimes ordinary sunburning will clear up psoriasis, and exposure to ultraviolet light may do the same thing; but as a rule this method of treatment is disappointing. Autoserotherapy is another method suggested, but it has not yet been proved of value. The same can be said of the treatment of psoriasis with vaccines. Seek and remove focal infections.

#### ARSENIC

In chronic cases when the disease has passed the stage of acute hyperemia, arsenic may be given in the form of Fowler's solution, three to ten minims, three times a day or as arsenous acid, in pills.

Arsenic should not be given when the eruption is active and increasing. When it has been given to full physiologic effect, as evidenced by pain in the stomach, nausea, vomiting, diarrhea, puffiness or redness of the eyes, albumin or blood in the urine, it should be stopped for several days.

The salicylates, alkalies and diuretics have also been recommended for internal use in psoriasis in some cases, also thyroid and iodid of potassium have seemed in some cases to yield good results.

#### LOCAL TREATMENT

The scales may be removed by scraping with a sharp curet and washing with hot water and green soap, or in hot baths containing 4 grams of sodium bicarbonate to each gallon of water. A stiff brush may be used. If the scales are hard and there is thickening a 5 per cent. salicylic acid ointment will aid in softening and removing them.

Chrysarobin is the remedy of chief reliance in removing the patches. It may be applied in the following manner:

	Gm. or C.c.	
R Chrysarobini .....	1	or gr. xv
Liquoris guttae perchae(N.F.)	10	3 iii

M. Sig.: Apply at night, with a camel's hair brush.

	Gm. or C.c.	
R Chrysarobini .....	3	3 i
Aetheris .....		or
Alcoholis .....	q. s. ad solutionem	
Collodii .....	25	3 i

M. Sig.: Apply at night with a camel's hair brush.

Chysarobin should not be used on the face and it should be remembered that the stains which it makes on clothing cannot be removed.

An ointment containing chrysarobin and salicylic acid (Dreuw's ointment) may be used over small areas on severely indurated lesions. The formula is:

	Gm. or C.c.	
R. Acidi salicylici .....	10	3 iii
Chrysarobini .....		
Olei rusci .....	20	or 3 vi
(Oil of Birchwood)		
Saponis mollis.....		
Petrolati .....	25	3 i

M. Sig.: "Rub in well, with a stiff brush, for five evenings. Then take hot baths on three successive evenings, using applications of olive oil in the meantime (to soften the skin). Repeat if necessary."

Chrysarobin may also be employed in a guttapercha paint like traumaticin.

"When there are patches of psoriasis on the face or scalp only the white precipitate ointment should be used, as the chysarobin is likely to give rise to severe erythema and edema in these regions."

It is best not to persist too long with any one remedy. Ammoniated mercury ointment, 5 to 10 per cent., may be of value, and ichthyol, tar, sulphur and beta-naphthol have likewise formed the chief ingredients of curative ointments.

#### DIET

Many patients with psoriasis are greatly benefited by a vegetarian diet. The intake of all nitrogenous



foods should be limited. Alcohol, highly seasoned food, salted meats, pastry and sweets should be forbidden.

### BOILS AND CARBUNCLES

These frequent and unwelcome visitors are always due to an infection. The greatest preventive is constant cleanliness of the back of the neck, the axillae, and the gluteal, perineal and genital regions, which are the parts most frequently affected with boils. The back of the neck is the most frequent place, in men, for boils and carbuncles to occur. Infection readily occurs in the hair of the lower part of the occiput and upper neck region.

A boil having occurred, contiguous hair follicles may become infected, or more distant parts of the body may develop one or more boils. Doubtless such isolated boils are frequently caused by direct transmission by scratching with contaminated fingers. Frequently boils occur from infection transmitted by way of the blood or lymphatics from some focus of suppuration; or a boil may infect the blood and cause crops of boils and repeated attacks after periods of remission. Repeated crops of boils may occur from foci of infection in the nose, nasal sinuses, tonsils, teeth and gums; they are not as likely to occur from a suppurating ear, from a fistula, or walled-off sinus, but it cannot be too frequently reiterated that foci of infection in the nose and mouth are a menace. Diabetes particularly predisposes to boils.

### ETIOLOGY

A furuncle, or boil, is an inflammation of the deeper layers of the skin and adjacent subcutaneous tissue, generally circumscribed about a hair follicle or sebaceous gland. The *Staphylococcus pyogenes-aureus* seems to be the most frequent germ of infection. The intruder, of course, rapidly propagates his species, irritation takes place, the blood vessels of the region become dilated, leukocytes hasten to the defense of the patient, and tumefaction, heat, and pain develop. The afflicted area becomes distinctly circumscribed, and, if not maltreated, may keep the infection within the bounds of the circumscription, with — if many lym-

phatics are in the region — a rather rapid congestion of the adjacent glands. These also become secondary defenses against infection of the body. The pressure of the part increases, circulation in its center is interfered with, and the central part or core of the inflamed region becomes necrosed, soon softens, and breaks through the skin, and more or less thin pus, with blood, escapes. This generally occurs in about a week. Soon after this the central dead tissue becomes loosened from the healthy surrounding tissue and is easily removed or evacuated. The cavity then granulates and rapidly heals.

#### TREATMENT

If a boil is first seen when it is only a slight nodule with a punctate white speck on the skin, it has long been considered that abortive treatment is advisable, and that most recommended has been to puncture through this white or red point on the skin into the hard tissue with a toothpick or wooden applicator, which has been dipped in liquid phenol (carbolic acid). Or, with a hypodermic needle, a drop or two of phenol has been injected directly into the center of the hardened part. However, although many times successful, the majority of boils cannot be so aborted, possibly because they are rarely seen at this early stage.

When a boil is first seen well on its way, incision before liquefaction and suppuration should be considered, although sometimes it does not hasten the process and may increase the pain.

The surrounding tissue of a boil should always be kept carefully cleansed with some mild antiseptic wash, as one of the liquid soaps, or even cleansed with a little ether. Then a wet dressing may be applied, best with some alkaline wash. Gauze saturated with such a solution and placed over the part, and a piece of oil silk over it, should be gently strapped or bandaged on. The gauze should be kept constantly moist with warm water. If the skin tends to become red and irritated about the boil, it should be soothed with petrolatum or with a dilute glycerin. No strong antiseptics should be used, any more than momentarily, on the skin.

Mercuric bichlorid dressings, so long used and so much overused, are bad treatment for the skin in these cases.

If the part around the boil is hairy, it should be gently and carefully shaved or closely clipped, and when the skin is perfectly dry, iodine may be painted once around the part; then proper simple cleanliness will prevent later infection of the hair follicles.

As soon as the boil is opened, or it has come so near the skin that it is best to incise the outer layer of skin to evacuate the pus, it should be dressed frequently. Besides the cleansing of the skin about the part with alkaline washes, an ointment, as sterile petrolatum, may be spread around on the healthy skin to prevent the more or less irritant excretions from the boil causing irritation to healthy parts. The wet alkaline poultices should be continued as long as there is a hard, inflammatory area. As soon as this induration has greatly diminished, the poultice part of the wet dressing should be stopped, that is, the oil silk, rubber tissue, or waxed paper should be omitted from the dressing, and simply the moist gauze placed over the boil. This wet dressing should be frequently changed, so that no pus is dammed back into the boil and free exit is constantly possible. This means that the dressing should be done at least twice in twenty-four hours, and better, three times.

At each dressing, little pieces of dried pus or tissue should be gently removed with forceps, and just enough pressure brought to bear to bring the particles of dead tissue within reach of the forceps; no squeezing should be allowed.

#### CARBUNCLES

It is practically impossible to determine in most instances that a patient has a carbuncle. An apparent boil is likely to develop into several boils, with several openings, and becomes a carbuncle. Carbuncles are more likely to occur in men, and in older men than in young men, and more frequently on the back of the neck than on any other part of the body. However, wherever a carbuncle is located, on account of the

large amount of tissue involved, there is always more or less danger from a phlebitis with thrombosis and possible direct infection of some large blood vessel.

It is necessary that such a multiple infection as a carbuncle should have free opening for evacuation as soon as suppuration occurs. It may be even advisable for a surgical decision as to whether or not radical excision is advisable to prevent the constant danger of infection in one of the large veins of the head. Carbuncles on the upper lip or near the nose are very dangerous.

It should be remembered that it is always possible for a boil or carbuncle to produce septicemia, and even a serious septic process of deeper structures of the body or of bones. In other words, while the individual boil is being treated, every possible focus of infection must be sought, and if one is found, means must be taken to eradicate it. A history of repeated boils and pustulations indicates a focus somewhere and, if it is not in direct evidence, all crowned and bridged teeth are under suspicion until the roentgen ray has proved them innocent.

#### GENERAL TREATMENT

As to general treatment, anything that makes for appetite, good digestion, proper movement of the bowels, and nutrition works for a successful fight against furunculosis. One of the recommended treatments is yeast. The ordinary compressed yeast cake is easily obtained and administered. The proper dose is about one third of a yeast cake, dissolved in a glass of water, twice a day. This makes a sour drink, and is not disagreeable to most persons. If it causes the bowels to become loose, the amount should be diminished. Yeast may have a beneficial action in gastrointestinal sluggishness, and apparently has power to change the flora of the intestine.

Sulphuric acid has been recommended in furunculosis, and sulphur is an old-fashioned treatment. If the patient is anemic, iron in some form should be given.



When there are multiple small spots of infection on the body, the underclothing should be frequently changed, and warm baths should be taken to prevent reinfection.

Stock vaccines, and more frequently autogenous vaccines, have occasionally been found valuable. On the other hand, sometimes vaccines fail utterly to prevent the recurrence of boils.

### ALOPECIA: BALDNESS

Several different forms of this condition have been described, of which the following are the types:

*Alopecia congenitalia* is an exceedingly rare condition in which a child is born without any hair. Microscopic examination of the skin in some cases shows an entire absence of follicles. In other cases the follicles are present, and after weeks, months, or possibly two or three years, the hair grows, although it is usually finer and thinner than in the average child of the same age.

Another variety is *alopecia senilis*, in which the loss of hair is an accompaniment and an indication of the general atrophy of the tissues throughout the entire body.

There is the disease called *alopecia areata*, which is characterized by a complete falling of hair from limited areas of the scalp or other hairy portion of the body. This is a distinct disease, and will not be considered in this connection.

There remains the form of *alopecia prematura*, in which the patient loses more or less hair, but in which this loss is not associated with the changes characteristic of old age. This form of premature baldness is customarily divided into two classes: the idiopathic and symptomatic. In the idiopathic form few causes can be found for the occurrence, while in the symptomatic form there will be found some pathologic condition of the scalp, or some disease which has affected the general nutrition of the entire body. Under the latter head may be included the falling of the hair which so frequently follows typhoid fever.

Omitting at the present time a discussion of the other forms of alopecia, a few words will be said regarding the common form of premature alopecia.

The most that can be said of premature baldness, according to Pusey, is that it is senile baldness coming on before the usual time. Of its causes we know actually nothing. We do, however, know the sequence of events.

Between the skin of the scalp and the skull there is a thick layer of fat to which the skin is loosely attached and on which it is freely movable. In civilized man, who lives in houses and wears hats, the following changes take place as he approaches later life: This fat layer gets thinner; the scalp becomes more firmly attached to the skull and less movable; the skin becomes more tense, and with these changes the hair becomes thinner and thinner over the top of the head. Finally, in extreme cases, the hair disappears and there is left a bald, glistening crown closely drawn over the skull. This sad picture is senile, spontaneous or simple baldness. Premature baldness is the same thing, only occurring before the age when these changes, which we ordinarily attribute to old age, are expected to appear.

What is the process that has taken place? There has been a disappearance in great part of the subcutaneous fat; the scalp has become much more dense in structure — has become fibrous or sclerotic — and with this shrinking in the scalp there has been a gradual shrinking in the hair follicles until they entirely disappear, and are replaced by fibrous tissue. It is a process much like that taking place in many of the tissues in later life, and in some of the organs, often as a result of disease. It resembles closely, for example, the destruction of the epithelial tubules in the kidneys that takes place as a result of chronic inflammatory processes. And it is a process that can readily be explained as a result of a chronic inflammatory process in the scalp. This is a reason for one view that all so-called senile baldness is really due to dandruff or seborrheic dermatitis. The sounder view seems to be that the change may be simply one of senile atrophy occurring as a primary process and not secondary to any diseased condition of the scalp.

The explanation of the fact that baldness is usually confined to the top of the head probably is that the increased tension of the scalp resulting from its shrinkage exerts its chief pressure on the top of the head. If one pulled a bag tightly down over the head it would exert much more pressure on the top of the head than around the border.

Simple or senile baldness, in spite of its name, usually begins to manifest itself early. The thinning of the hair becomes apparent before the age of 30 in 80 per cent of the cases, and persons who are not nearly bald at 50 are likely to keep a passable covering of hair until they reach old age.

The definite causes of simple baldness are uncertain, and there is much room for speculation. As a result, all sorts of factors are invoked to explain it, from the wearing of tight hats to improper methods of breathing. Some would go so far as to say that there is no such thing and to attribute all of the cases to seborrheic dermatitis. This is an extreme view; but certainly the ravages of dandruff have to be taken into account in all cases of baldness, and in considering the causes of the condition no separation can be made between simple baldness and that due to dandruff.

Baldness is much commoner in men than in women. This is true, however, only of complete baldness; thinning of the hair is commoner, perhaps, in women than in men. The reasons for the occurrence of baldness less frequently in women than in men are probably various. In the first place, women give much more attention to the toilet of the hair—to brushing it, and keeping it clean and in good condition; their hats are light things that merely rest on the hair, and, finally, the fat layer of the scalp, as of the skin generally, is more abundant in women than in men and atrophies later in life. Man sometimes is inclined to have it that baldness is a sign of intelligence and a result of mental labor and that this is the reason it is commoner in men. This fiction is one of the few consolations that can be urged for the condition, and it seems mean to disturb it; but, truth to tell, there is no ground for it. Baldness may make one look wiser, but

it occurs indifferently in the great and small, and it is no more a sign of wisdom than long hair is of genius.

The broad fact seems to be that in the common occurrence of baldness we have a manifestation of a transitional stage in man's evolution. The hair on the body now is the vestige of a former abundant coat. In the economy of nature, structures atrophy and disappear when they cease to have function, and the need of warmth and other protection afforded by the hair is no longer of great importance to man. Man now uses a hat instead of relying for protection for his head on a shock of hair as his ancestors did, and, as a result, in spite of all his coaxing, the shock of hair is gradually vanishing. This does not mean that you and I can save our hair by discarding our hats. We are a result of our ancestors, and to save our hair we would have to discard the hats of all our ancestors for scores of generations back.

According to this view, heredity is one of the great causes of baldness, and all statistics indicate that this is true. In the statistics of Jackson and of White, the condition is due to heredity in from 30 to 40 per cent. of the cases.

Mistreatment of the hair is also an important factor in the production of baldness. Daily wetting of the hair, especially if no attention is given to drying it, keeping it poor in oil by excessive use of soap and water without supplying any fat in place of that removed, failure to keep it clean, excessive exposure to sunlight, the indiscriminate use of drugs, particularly "hair tonics," and overzealous treatment by barbers and hairdressers—all of these causes are influential in the production of baldness, and are to be guarded against, particularly in the care of the hair of those who have already a predisposition to the condition.

The effects of heavy and tight hats by interfering with the circulation of the scalp is considered to be of great importance, and there can be little doubt that it is a factor to be considered. Hats should be light. They should provide for circulation of air, and should not bind the head. It can at least be said for women's hats that usually they are better in these respects than men's.



But after all other factors have been considered, we must still come back to seborrheic dermatitis — dandruff — as the most important cause, and the one to which most care must be given in preventing baldness. According to White's statistics, it is a factor, and perhaps the chief factor, in 79 per cent. of the cases; according to Jackson's, in 72 per cent., and according to Elliot's in 91 per cent.

#### PROPHYLAXIS

It is apparently little considered by the average individual that the hair should receive as particular care as do the teeth and nails. To be sure, it is the custom of most people to comb their hair, but this is generally done for the cosmetic rather than for hygienic effect. By improper care of the hair great harm can be done, and conversely, people who desire to preserve their hair in good condition should take pains to encourage its healthy growth. Many people overdo the matter of making applications to the scalp, applying strong alcoholic preparations or other so-called tonics too frequently. Others, with an excess of pains, bathe it too frequently, especially with cold water, as is the case with people who take a daily cold shower bath. Others indulge too frequently in the luxury of a shampoo. While occasional washing of the hair is beneficial, too frequent application of water to the hair does harm by withdrawing the natural oil from the hair and scalp. The best authorities advise shampooing the scalp not more frequently than once a week and not less frequently than once a month. Probably nothing better can be used on these occasions than Castile soap and warm water.

With women, the case is somewhat different, but they have their special unhygienic practices which must be mentioned and condemned, especially the curling of the hair by winding it about hot curling-irons or doing it up in curling papers over night.

In women, if hair is found to be cracking at the ends and becoming thin and unhealthy, the ends should be cut off.

The popular remedies to prevent falling of the hair would fill an encyclopedia. Vibratory and electrical treatments, hair tonics that feed the hair roots, as though they grew out of the scalp like broom-sedge out of an old field, neat's-foot oil and crude kerosene, massage and mange cures, all have their futile trials. Among them must also be included a method highly recommended by many barbers and beauty specialists, namely, singeing the hair. This is recommended to overcome splitting at the ends and to prevent falling of the hair, the reason for the latter being that it "closes the pores and keeps the fluid in the hair." With the long hair of a woman which has a tendency to split at the ends, it is possible that singeing the tips may be of some use; it substitutes a charred blunt end of fused horn for one tapering to the point or cut clean across. But even in cases of this sort it is less useful than greasing lightly the hair and thus supplying the fat which is lacking in such hair. For the hair of men, which is kept short, singeing is not of any use in preventing the splitting; hair which is not allowed to grow to its natural length does not split, unless it has a deep-seated disturbance for which there is no such simple remedy. Of course singeing the hair-ends in order to prevent the fluid in the hair from escaping, like sap from a tree, is based on an entire misconception of the hair's structure and nutrition. The hair does not contain any more sap than a buggy whip; it is not nourished by any fluid in it, but by the blood plasma that reaches only the hair root. The hair above the skin surface is a spine of horn, which is even oiled from without, and singeing its tips has no effect whatever on either its nourishment or its growth. It is certain that singeing the hair is of no value in preventing its fall; in fact the only value the procedure has is to the zealous hairdresser who gets his little fee for doing it—unless it is worth a dollar to the seeker after hair to think he is doing something, even if he is not.

#### TREATMENT

The treatment of baldness, whether due to a local inflammation of the scalp, or to the result of some general disturbance of nutrition, is a somewhat puz-

zling matter. The treatment adopted must be continued for several weeks, or even months, before a result of much importance can be observed. Obviously at first the constitutional condition of the patient should be carefully inquired into, and any disturbance of it should be promptly remedied. If care and worry are apparently important factors in the disease, these should be remedied as far as possible. If the digestion is not properly performed, measures should be adopted which will correct it.

Certain internal remedies have appeared to have some control over the nutrition of the skin and scalp. Perhaps none surpasses arsenic in this respect, and in many cases the use of this drug will seem to contribute to a favorable result. If anemia is present, iron may be combined with arsenic. For instance:

	Gm. or C.c.	
R Arseni trioxidi .....	4	gr. $\frac{1}{2}$
Massae ferri carbonatis ....	2	or $\frac{3}{4}$ ss
M. et fac pilulas 20.		

Sig.: Take one pill, three times a day, after meals.

Another drug which has appeared to have a selective action on the skin and scalp is sulphur, and in some cases this drug has been given with benefit, especially if there is constipation, or if there is observed a tendency to suppurative inflammation of the skin.

The question of local applications to the scalp is one which must be approached with some hesitation. The variety of drugs which have been recommended for application to the scalp to stimulate the growth of the hair is so great that one naturally feels suspicious in regard to the value of any one. This, however, must not discourage the physician from trying to select a suitable one which will prove of benefit to his patient. If dandruff is abundant on the scalp, one of the simplest applications is a solution of borax, with glycerin and water.

	Gm. or C.c.	
R Sodii boratis .....	4	3 i
Glycerini .....	25	or fl 3 v
Aquae .....	q. s. ad 200	fl 3 vi

M. Sig.: Shake, and apply externally twice a day.

This, like all applications designed for use on the scalp or for the purpose of stimulating the growth of the hair, should be applied to the scalp and not to the hair. This may be accomplished by using a comb to part the hair, separating it so that the application may be made directly to the scalp, and when the application has been made along one part, making successive applications along other parts, until the entire scalp has been treated.

Another remedy which has been extensively used for the relief of dandruff is resorcin. This may be used in the form of either a lotion or an ointment.

	Gm. or C.c.		
℞ Resorcinolis .....	6	or	℥ iss
Alcoholis .....	75		℥℥ iii
Aquae .....q. s. ad	200		℥℥ viii

M. Sig.: Shake and apply to the scalp twice a day.

Or:

	Gm. or C.c.		
℞ Resorcinolis .....	50	or	gr. x
Adipis lanæ hydrosi .....	25		℥ i

M. Sig.: Rub into the scalp twice a day.

These remedies are especially useful when there is any evidence of inflammatory action in the scalp because of their soothing and anti-inflammatory action. In these cases remedies which are stimulating should be avoided. If there is no evident pathologic process going on in the skin except the falling of the hair, more stimulating remedies may be applied. Of these the most important are alcohol, quinin, cantharides, and ammonia. These, with resorcin, which has been already mentioned, are the fundamental ingredients of most popular hair tonics. Bay rum, a favorite application to the hair with many people, owes its pleasant effect largely to the alcohol contained in it.

The tincture of cantharides is often combined with alcohol and castor oil, as in the following prescription:

	Gm. or C.c.		
℞ Tincturae cantharidis .....	10	or	℥℥ iii
Olei ricini .....	5		℥℥ iss
Alcoholis .....q. s. ad	100		℥℥ iv

M. Sig.: Apply externally.



When corrosive sublimate is used the proper strength is 1 part to 2,000 or 3,000 of water.

A sulphur ointment may sometimes be used with advantage.

### URTICARIA

The causes of simple urticaria are food (protein) poisoning, intestinal parasites, poisoning by certain drugs, disturbances of the liver or kidneys, gout, conditions associated with an increased amount of uric acid in the urine, constipation, an abnormally dry skin, and, in fact, anything that impedes normal elimination. Circulatory disturbances, especially when combined with high blood pressure or arteriosclerosis, may be factors in causing urticarial eruptions.

Urticaria may occur, however, from almost any feverish condition or from any infection, and simply becomes, then, an added symptom. Most frequently urticaria is the most important symptom and, from its intense itching, is the cause of the patient seeking medical advice.

The following treatment of simple urticaria is generally efficient, namely, catharsis, a limited milk or cereal diet, large amounts of water, the administration of alkalis, such as potassium citrate in 2 gm. (30 grain) doses, given four or five times in twenty-four hours, or some other alkali, if preferred. Potassium citrate may be given as follows:

Gm. or C.c.

R Potassii citratis .....	40		or	3 x
Aquae gaultheriae .....	200			fl℥vi

M. Sig.: Two teaspoonfuls, in water, every four hours.

If it is known that the stomach and intestines have been irritated, bismuth subcarbonate and sodium bicarbonate should be administered, and, if the patient does not quickly recover, some form of calcium should be given.

The patient should be kept cool. Thin and non-irritating underwear should be used. If the patient is a child or one in whom the condition tends to recur, linen or silk underwear should be worn. Warm baths, the water made alkaline with sodium bicarbonate, are soothing to urticarial patients, and will relieve the itch-

ing. The skin should not be rubbed, but should be mopped, lest the drying process cause irritation and more itching. The localized spots may be sprayed with alcohol, cologne, or even mild acid applications, such as vinegar. Phenol solutions have long been used to dull the irritability of the peripheral nerves; a 2 per cent. solution, with or without glycerin often suffices, as:

		Gm. or C.c.	
R	Phenolis liquefacti .....	4	3 i
	Glycerini .....	25	or fl 3 i
	Aquae menthae piperitae.....		
	.....q. s. ad 200		fl 3 viii
M. Sig.: Use externally as a lotion.			

[The preceding should be well shaken and should be labeled as poison.]

Sometimes such applications as "extract of witch-hazel" or a bland oil like almond oil will be soothing to the irritated skin. If the urticarial spots are not in large numbers, such applications as camphor or chloral, with or without menthol, are often valuable, as:

		Gm. or C.c.	
R	Camphorae .....		
	Chlorali hydrati .....	2	or 3 ss
	Glycerini .....	25	fl 3 i
	Alcoholis .....	q. s. ad 100	fl 3 iv
M. Sig.: Use externally. [Shake, and label as poison.]			

		Gm. or C.c.	
R	Camphorae .....		
	Chlorali hydrati .....	2	3 ss
	Mentholis .....	1	or gr. xv
	Glycerini .....	25	fl 3 i
	Alcoholis .....	q. s. ad 100	fl 3 iv
M. Sig.: Use externally. [Shake, and label as poison.]			

Various dusting powders are often of benefit, especially in children suffering from this condition. The simplest is powdered starch or a talcum powder. Sometimes stearate of zinc, with or without menthol, is of value as tending to adhere to the region that is irritated. A simple formula frequently recommended is Anderson's dusting powder:

		Gm. or C.c.	
R	Amyli pulveris .....	24/0	3 vi
	Zinci oxidi .....	6/0	3 iss
	Camphorae pulveris .....	2/0	3 ss
Mice et fiat pulvis.			

When urticaria continues or recurs, as it does occasionally in its milder forms, the whole physical condition, diet, and personal hygiene, of the patient must be very carefully investigated. Some wrong condition will be found, and when it is corrected the disturbance will disappear. Especially must the intestinal digestion be studied. If constipation or indigestion is present measures to prevent the absorption of the irritants will generally cure the urticaria. Occasionally in young or older persons in whom a high tension or arteriosclerosis has begun or who have insufficient kidneys, conditions of the skin exist that cause temporary reddening, and perhaps itching, with the least irritation. The patient may be tested as to his sensitivity to various food substances by beginning with a simple milk diet and gradually adding one article after another until he finds the one that invariably produces recurrence of attacks. Skin tests with extracts of various proteins may discover a food that is at fault.

The skin may be so hypersensitive as to allow of what is termed "dermographia." This condition is a pseudo-urticaria, and the treatments that tend to relieve urticaria will generally relieve this condition.

When there are angioneurotic edemas, a diminution of the sodium chlorid in the food will often be a valuable adjunct to the other treatment inaugurated. This is especially true if the kidneys are at all insufficient.

Giant urticaria, on the other hand, is a serious, dangerous affection, especially if it attacks the face and mouth; as, when present elsewhere, it is likely to do at any moment, and dangerous swelling in the throat and larynx may occur. This condition should be treated energetically, and the patient should be under close observation.

The treatment of giant urticaria is catharsis with calomel and saline cathartics; a milk diet, if milk agrees with the patient; or a plain water diet; or a cereal diet. Calcium should be given, and alkalies in large doses. Occasionally, large doses of quinin, such as 60 cg. (10 grains) twice a day, or good-sized doses of antipyrin, as 1 gm. (15 grains) three times a day, have seemed almost specific. Atropin pushed to physiologic action

is sometimes of value. The exact cause of this serious condition has not been determined. Doubtless, however, it is anaphylactic and due to protein poisoning.

### ROENTGEN DERMATITIS

The wide use of the roentgen ray in the treatment of various diseases has led to the occurrence of roentgen burns with dermatitis and severe rapidly growing new growths. Caldwell, Abbe and others are convinced that the most practical, easiest applied treatment is the use of radium. The application of radium is free from pain and under its influence the lesions seem to retrogress. The effectiveness of the freezing methods and of the electric-spark methods cannot be questioned, but they are both painful. Sparks can sometimes be applied in situations impossible to reach with liquid air or carbon-dioxid snow. Of the two methods, freezing is somewhat less painful. The value of surgery in such cases has been demonstrated beyond any shadow of doubt, but these operations are dangerous and they call for exceptional surgical judgment and technical skill. Under the best conditions excision cannot be safely done ordinarily without sacrificing healthy tissue. The possibility of hastening metastasis must always be considered.

Dodd has found the following application simple and efficacious in the treatment of the ordinary acute reaction following roentgen-ray exposure:

	Gm. or C.c.	
R Zinci oxidi .....	25	3 i
Phenolis .....	2	or 3 ss
Glycerini .....	4	3 i
Aquae calcis .....	200	3 viii

Shake well and bathe area for five to ten minutes, twice or three times a day. Avoid all heavy dressings and, when possible, expose the lesion to air. Do not apply this remedy on a dressing, but sop it on and let the air get to the lesion.

A valuable lotion in these cases is Liquor Alumini Subacetatis (Burow's solution) 1 part to 15 parts of water. It may be used in the form of a wet dressing. Between attacks the hands may be kept soft by application of some bland ointment such as cold cream.



## CHAPPED HANDS

The chief reason for chapping of the hands is the lack of fat in the skin in cold weather. Fat production in the skin is at a minimum in cold weather, because of the diminished sebaceous and sweat secretion. This and the dry air of winter make the skin dry and vulnerable at the very time when the cold air itself is irritating. This combination leads readily to chapping if the hands must be exposed much to soap and water, and particularly if the irritation of antiseptics is added, as in the case of physicians and nurses.

The first thing to do to prevent or overcome the condition is to supply, by greasing the skin occasionally, the lacking fat in the skin. Almost any bland fat or semisolid hydrocarbon will do for this purpose, but nothing is better than a well-made cold cream. The next and more difficult thing to do is to avoid soap and water—especially soap—as much as possible; and it is here that hand lotions serve a very useful purpose.

Hand lotions are generally of two types: (1) glycerin solutions of the glycerin, rose water and benzoin kind, and (2) gelatinous liquids made with tragacanth, quince seed, or some other water-soluble colloid. The glycerin lotions work well with some skins and are the most satisfactory to an occasional individual; but as a rule they are not the best, first, because the glycerin tends to make drier a skin already too dry and, second, because these lotions have little or no detergent effect and do not clean the skin.

The tragacanth and quince-seed lotions are better, and of these the tragacanth lotions are certainly as good as any other and are very cheap and easy to make. A formula for such a lotion given by Pusey is as follows:

		Gm. or C.c.	
R	Tragacanth .....	4	3 i
	Glycerin .....	60	3 ii
	Boric acid.....	12	3 iii
	Water .....	q. s. ad 500	O i
	Oil of bergamot .....	60	gr. x

The oil mentioned being added as a perfume might be omitted, according to the wish of the prescriber.

The boric acid, glycerin and water are first mixed, the tragacanth added and the mixture agitated until the tragacanth is dissolved. This makes a rather thick mucilage; it can be changed to any consistency desired by slight increase or decrease in the amount of tragacanth.

A lotion like this has a considerable detergent effect; it is a fair substitute for soap, and if it is freely rubbed over the hands and wiped off, either with or without the use of water, cleans the skin of all but the most tenacious dirt. It, of course, cannot be effectually used as a complete substitute for soap. Such a lotion has the advantage over soap that it not only is not irritating to sensitive skin but also is bland and soothing. It thus tends to prevent and eventually to cure chapping of the hands.

### CHILBLAIN

The conditions favoring chilblain are impaired and weak circulation. Hence it is seen chiefly in the lower extremities, especially in the feet, but may affect also the fingers, ears, nose and cheeks, parts especially exposed to the cold.

The principal manifestations of the disorder are a burning heat, with itching and redness. These symptoms are usually worse at night.

Rapid change of temperature or prolonged exposure to cold, and especially to cold combined with dampness and moisture, undoubtedly produces slight histologic changes, of an inflammatory character, in the cutaneous structures. These have been designated by some writers as chronic erythematous dermatitis.

Relief is sometimes obtained by painting the affected part with equal parts of tincture of iodine and tincture of opium. Oil of peppermint diluted with from one to six parts of glycerin has been recommended as affording relief.

Prophylactic measures may be taken against chilblains before the advent of cold weather, or between exacerbations. The patient should be instructed to wear warm, loose woolen stockings and warm shoes.

The feet should be bathed in warm water daily, and after the bath should be rubbed briskly, quickly dried, and a bland powder dusted on.

When the chilblains have developed, more active treatment should be employed. If the patient's general health is below normal, tonics are indicated. When the condition is very acute, it is well to use soothing lotions, as a calamine lotion, freely for a time. In the less acute cases, the greatest improvement is usually obtained with the use of stimulating applications, but the large number of these which have been recommended shows that no one of them is successful in all instances. Ichthyol, either in the form of a 25 per cent. ointment, or used in lotion form, one part to two or three parts of water, is perhaps most commonly recommended. Rubbing with oil of turpentine, pure or diluted, with camphorated soap liniment or with phenolated oil, is sometimes employed. In the stubborn cases, the use of the galvanic current has at times produced a favorable effect, the positive pole being applied to the affected part, the negative pole to a neighboring region, near the truncal nerve.

If the chilblain undergoes ulceration, treat as any other ulcer.

When the inflammation proves resistant to treatment, the possibility that the affection is something more serious than chilblains, perhaps either lupus erythematosus or Renaud's disease, must be considered.

Hot air treatment has been found useful when the condition is of long standing.

The following simple combinations may be of benefit for chilblains, painful corns or bunions:

Gm. or C.c.			
℞	Mentholis .....	1	gr. xv
	Methylis salicylatis .....	8	or 3 ii
	Adipis lanæ hydrosi .....	25	3 vi

M. Sig.: Apply a small quantity frequently, rubbing in until absorbed.

Gm. or C.c.			
℞	Camphoræ .....	1	50 gr. xx
	Balsami peruviani .....	1	50 gr. vii
	Olei amygdalæ dulcis .....	10	or 3 iii
	Adipis lanæ hydrosi .....		
	Aquæ rosæ .....	25	3i

M. Sig.: Use externally.

**FROSTBITE**

If chilblain is regarded as a chronic affection generally due to the action of cold, frostbite may be regarded as an acute affection due to the action of cold. When a portion of the body not properly protected is exposed to intense or extreme cold the tissues become affected, and if the cold is sufficiently intense and the exposure is sufficiently prolonged the part becomes frozen. Individuals in whom the circulation is weak, particularly the young, the old and the debilitated, are especially likely to suffer from intense cold. Likewise those parts in which the circulation is least active, and which are least protected by clothing, as the ears, hands and feet, are prone to suffer.

Different degrees of frostbite are recognized. In the slighter forms, the smaller arteries become contracted, the circulation becomes slow, and there is venous stasis. This is accompanied by a change in the various structures, and also in the blood contained in the vessels of the affected part.

If the cold is more intense or the exposure is more prolonged, vesicles and blisters or blebs, containing often sanguinolent fluid, form.

Finally, if the exposure is sufficiently severe and sufficiently prolonged, the entire part becomes congealed, and freezing and gangrene result.

Locally the part becomes cold, pale, or bluish, shrunken or wrinkled, and there is loss of sensation and diminution, or entire loss, of the power of motion.

Constitutional symptoms vary with the condition of the individual and the extent of the lesion. Loss of energy, fatigue and weakness are early symptoms. These may be followed by indisposition to continued exertion, difficulty of speech, delirium, coma, and death.

The rule for treatment must be to save as much of the injured extremities as possible, and as it is impossible to say how much of the damaged tissues will survive, immediate or early amputation is absolutely contraindicated. The best treatment at first is friction with snow or cold water in a cold room, the changes to a warmer atmosphere being gradually brought about. After the friction the limbs should be raised on



pillows and swathed in cotton-wool, which can be held in position by bandages applied loosely so as to avoid any danger of constriction. If blisters form, or discoloration of the toes or other parts shows that gangrene is probable, the whole foot should be cleansed aseptically and then strips of sterilized gauze should be applied between the toes and the same gauze made to cover the whole foot, which is then enveloped in sterilized cotton-wool. Any blisters—which will be found to contain dark blood-stained fluid—should be snipped and carefully dried and dressed.

Every effort should be made to keep the parts dry and sterile. If gangrene occurs the surgeon should on no account make too great haste to amputate, as the tissues adjoining the line of demarcation become more and more healthy and the line of granulation tissue between the dead and living tissues, if kept aseptic, gives rise to little discharge and can be kept aseptic by daily dressings. Ultimately, when and how to operate become surgical decisions.

### ECZEMA

Eczema is a non-microbic inflammation of the skin, occurring probably from a number of different causes, external and internal, of a toxic, digestive or nervous nature. It is characterized by inflammation and redness, vesication, weeping and exudation, formation of crusts and scales, ill defined lesions, spreading peripherally and, as a rule, intense itching.

Heimann, Knowles and others have contended that the condition is synonymous with dermatitis. Knowles (*Journal A. M. A.*, Jan. 13, 1917, p. 79) found that of thousands of cases, almost one third were of definite external origin. About one sixth of all cases of this affection are caused by the occupation of the individual. Micro-organisms play only a secondary rôle in the causation of the disease. Practically every occupation and every irritant may produce an eczema. The portions of the skin exposed to the irritant determine the site of the outbreak. The eruption not infrequently extends beyond the irritated areas, at times being observed on distant parts of the cutaneous surface, and also generally over the body in certain instances. The

usual type of eruption noted is the vesicular or the erythematous-squamous. The eruptions last for weeks, months and years, and show a marked tendency to relapse. It is rather hard, he says, to explain the susceptibility of some persons to certain irritants, while others are not affected, except on the theory of a pure idiosyncrasy, an anaphylactic tendency causing sensitization of the skin.

Charles J. White (*Journal A. M. A.*, Jan. 13, 1917, p. 81) made skin tests with extracts of food substances on a large number of persons with eczema and found specific sensitization. He also made examinations of the stools as to the presence of excess of fats, soaps or starches. He concludes that a goodly proportion of persons afflicted with eczema show sensitization to various types of food and that a much larger proportion are unable wholly to digest all the elements of the food they eat.

#### TREATMENT

A thorough investigation of the patient's history with particular reference to occupation should be made to find if he is being exposed to any particular irritant. Persons who are susceptible to chapping should be careful to dry the hands thoroughly after washing and perhaps apply regularly a protective lotion such as is described for that condition. Soap should be used very sparingly, if at all.

The diet should be very simple, avoiding particularly alcohol, coffee, all spiced and highly seasoned foods and large quantities of meat. The bowels should move well daily. In some cases it may be necessary to make an analysis for particular sensitization to some food substance as described under urticaria. Water should be drunk abundantly.

Internally no drug has any special value. Many have been tried and have seemed at times to yield good results, only to fail in the next case or later in the same case.

As indicated by Eisenstaedt (*Jour. A. M. A.* 74: 667, 1920), the dietary management of a patient is one of the most important features in the treatment of eczema. Some patients do not tolerate carbohydrates

well, and in these cases a reduction of carbohydrate intake almost to complete elimination is necessary. It is well to examine the urine, noting any change from normal; sugar especially should be looked for. Some cases of carbohydrate intolerance, while showing no sugar in the urine, present quite constantly an increased amount of sugar in the blood.

Other patients are intolerant of sodium chlorid, and some eat excessive quantities of nitrogenous articles of food.

In persons past middle life suffering from eczema, nephritic changes should be looked for, and if present, properly treated. Other patients with eczema present an anaphylactoid if not a true anaphylactic reaction against specific proteins or proteins of certain groups, among which may be mentioned egg albumin, pork, and the protein of cow's milk. The patient himself may connect the ingestion of certain articles of diet with the appearance of the eruption. It is well, therefore, to put the patient on an absolutely bland diet, which is readily digestible and which contains little or none of the substances that experience has shown may be productive of eczema.

In some patients the predisposition to eczema can in a greater or less degree be controlled by organotherapy. However, as Eisenstaedt points out, the physiology and therapeutic uses of the ductless gland substances are in general so poorly understood that it is impossible to give clear-cut indications for their use, and the suggestion is offered merely as one that they may sometimes be helpful in the management of eczema.

Local treatment is largely symptomatic. It includes removal of crusts, antiseptic treatment if there is secondary pus infection, protection from itching and irritation, and various local preparations for curative purposes. To remove the crusts Sequeira recommends a simple boric starch poultice. One teaspoonful of boric acid and one half an ounce of starch are mixed into a paste with a small quantity of cold water. On this are poured 15 ounces of boiling water and well stirred. This is spread on gauze and applied to the lesions which, after softening, are removed. Until the supuration is relieved the wet dressings of boric acid or

of 1 per cent. Burow's solution (liquor alumini subacetatis) may be continued.

If wet dressings are difficult to handle, antiseptic ointment such as boric acid, 4 gms. to an ounce, or ammoniated mercury, 1 gram to the ounce, may be utilized.

When the suppuration is relieved it is necessary to treat the exudative condition. Soothing antipruritic lotions and subsequently fatty preparations are most useful. Among the lotions used are the Burow's solution, 1 gram to an ounce of water; phenol, 1 gram to an ounce of water; or camphor-chloral, 1 c.c. to an ounce of water. Relief is also obtained by the application of cloths wrung out of hot water or water containing one-half teaspoonful of baking soda to a pint of water. Following the lotions a simple zinc ointment may be applied. As the weeping subsides a lotion containing a residual powder may be used such as a calamin lotion with 1 per cent. phenol or liquor alumini subacetatis (1 per cent.). With the lotion may be used mild ointments, such as fresh zinc or rose ointment and antipruritic combinations with phenol, camphor or menthol. Or, as a substitute, Lassar's paste with 1 per cent. of salicylic acid may be tried. If it dries and cakes it may be removed with oil.

In acute papular or papulovesicular eczema the skin may be so irritable that ointments are not well tolerated. Here Eisenstaedt (*Jour. A. M. A.* 74: 667, 1920) recommends applications of a mild alcoholic solution of 0.5 per cent. of salicylic acid followed by the use of a bland dusting powder every three or four hours.

	Gm. or C.c.
R Salicylic acid .....	1½
Diluted alcohol .....	240

Label: Apply to affected parts.

	Gm.
R Starch .....	60
Talcum .....	60

Label: Use as dusting powder.

After the acute condition subsides dusting powders containing equal parts of zinc oxid and starch or talc with salicylic acid; phenol, tar, or salol, 1 per cent. or boric acid, 15 per cent. may be utilized. Or at this



time the soothing tragacanth jelly described for treatment of chapping may be applied.

Or the following may be tried:

	Gm.
R Zinc oxid .....	
Talcum .....ãã	15
Petrolatum .....	30
Label: Apply to inflamed parts.	

	Gm. or C.c.
R Zinc oxid .....	
Starch .....	
Glycerin .....	
Distilled water .....ãã	15
Label: Zinc oxid lotion.	

The skin may return to normal under this treatment. Usually, however, stimulating applications are necessary to complete the treatment and to rid the skin of the results of the inflammatory process. These must be applied with great caution, to prevent setting up the troubles anew. Small doses of tar,  $7\frac{1}{2}$  grains to the ounce, may be utilized in ointments. The quantity may be gradually increased to double or four times this strength. Tar preparations, such as the oil of cade or rectified oil of birch tar, ichthyol and its allied preparations, or salicylic acid, may be added.

	Gm. or C.c.
R Zinc oxid .....	
Talcum .....ãã	10
Petrolatum .....	20
Rectified oil of birch tar...	3
Label: Tar-zinc paste.	

Other drugs used are mercury, phenol, sulphur, betanaphthol or salicylic acid in ointments beginning with weak concentrations and gradually increasing to perhaps 15 grains to an ounce of ointment.

Old chronically exacerbating eczemas are most difficult to treat satisfactorily without all the facilities available to those specializing in the treatment of skin diseases. It is not wise, therefore, to hesitate too long before giving patients the advantage of such expert assistance.

**HYPERKERATOTIC ECZEMA OF PALMS AND SOLES**

This type of eczema follows exposure of the hands to injurious influences such as rough weather, water, cleansing agents, chemical solutions and various traumatisms, and the encasing of the feet in ill-fitting and deforming shoes, which produce callosities and breaking down of the arch, thereby increasing sweating of the soles and resulting in maceration of the keratotic, thick epithelium.

Locally a plaster may be employed, containing 5 per cent. salicylic acid.

This is applied on the fingers and covered with zinc oxid adhesive plaster, so as to intensify its action. This is changed once in twenty-four hours. Under its use the hard callus of the fingers melt down, and the skin becomes smooth and supple. This plaster cannot be applied to the feet as it would crumple up in walking, but an ointment may be prepared of about 12 per cent. salicylic acid in equal parts of lanolin and petrolatum, as follows:

	Gm. or C.c.		
R Acidi salicylici .....	8	or	3 ii
Adipis lanae hydrosi.....			
Petrolati .....	30		3 i
M.			

This is applied in the morning, so that in walking it will be massaged into the skin. A few days later, when the patient is able to resume work, an ointment composed of one part of mercury in ninety-nine parts of simple ointment is used.

	Gm. or C.c.		
R Hydrarg. salicylatis .....	1	or	gr. xv
Unguenti .....	99		5 iv

The official unguentum acidi borici often acts well; the white precipitate in 2 to 4 per cent. strength in an ointment, may, in some instances, be better than the salicylate of mercury as given in one of the above prescriptions. According to Eisenstaedt, the first therapeutic indication is the removal of horny accumulation, so that the underlying inflammatory process may be influenced by the medication ordered. This can be accomplished by energetic therapy which produces

maceration, for which a suitable ointment applied to a mull bandage and brought into intimate apposition with the skin is very useful.

	Gm. or C.c.
℞ Diachylon ointment .....	30
Oil of cade.....	6
Label: Apply on linen and bandage.	

During and after this mode of treatment it is well to use a formaldehyd ointment, because of the marked hyperhidrosis which is frequently associated with this form of eczema.

	Gm. or C.c.
℞ Solucion of formaldehyd....	5
Menthol .....	5
Wool fat .....	
Petrolatum .....	25
Label: Formaldehyd ointment.	

Some of the best results in treating eczema of the soles, and especially of the palms, have been obtained by Montgomery and Culver by the use of roentgen rays, after all other lines of treatment have failed, for months or even years.

### SWEATING OF THE FEET AND AXILLAE

Excessive perspiration of the feet and the skin of the axillae is a most annoying condition, and one that frequently is difficult to control satisfactorily. Besides keeping the parts properly bathed and cool, attention should be given to the clothing and shoes. Rubber soled shoes are objectionable if there is excessive sweating of the feet. Air-tight dress shields should likewise be discarded.

Various remedies have been suggested. Most recent and quite efficient is the remedy suggested by Stillmans. He states that a 25 per cent. solution of aluminum chlorid in distilled water, dabbed gently on the part every second or third day and allowed to dry, will cause a rapid amelioration of the excessive sweating. Three applications are usually sufficient. If the condition recurs, the treatment may be repeated.

An older remedy is the application of a 2 per cent. solution of the official liquor formaldehydi in water

to the axillae, and up to a 5 per cent. solution for the feet.

Pure glycerin rubbed on the feet will at times stop offensive sweating. Potassium permanganate solutions of about 5 parts to 1,000 have been found efficient as a wash for the feet.

Tannic acid may be used as follows:

	Gm. or C.c.
R Tannic acid.....	5
Alcohol .....	100
Water .....	up to 200

Use as a wash twice a day.

Various drying powders have also been suggested for this condition, as:

	Gm. or C.c.
R Boric acid.....	10
Purified talc.....	100

	Gm. or C.c.
R Salicylic acid.....	5
Bismuth subnitrate.....	40
Zinc stearate.....	20

	Gm. or C.c.
R Salicylic acid.....	2
Bismuth subnitrate.....	20
Starch .....	20

In very severe cases, treatment with the roentgen ray will control the condition. This treatment, in unskilled hands, is not altogether safe.

The use of the solutions of aluminum chlorid or formaldehyd may, in some cases, cause a mild dermatitis, perhaps with itching. This may be ameliorated with protection of the parts against scratching, and the application of ointments, such as cold cream containing 12 per cent. boric acid, or a calamine lotion. If there is much itching, 0.5 per cent. phenol may be incorporated in the calamine lotion.

## BURNS

It is customary, following Hebra, to classify burns by three degrees. This classification is based on the extent of the pathology, varying from simple inflammatory reactions of the skin to a primary necrosis. In a review of the management of burns Ravogli stated



that the best treatment is that which favors sloughing of the burned skin, maintains sterility of the resulting wound and promotes granulation and the forming of new epidermis.

In burns of the first degree Ravogli believes that the application of a dry powder, such as talcum, bismuth or burnt alum, is the best treatment. Salves and baths are inadvisable because of the possibility of excoriation and maceration of the epidermis, with secondary infection. When there is severe pain a compress moistened with a 2 to 5 per cent. solution of aluminum subacetate is applied to relieve the pain. The solution used is the liquor alumini subacetatis (Burow's solution), one part to fifteen parts of water. As soon as the pain is relieved, the skin should be dried and a powder applied.

In second degree burns, as soon as the blisters are distended with serum they are evacuated, leaving the epidermis in place to protect the papillary layer. Compresses of aluminum subacetate are advised here also. The application of compresses moistened with 1 per cent. picric acid solution have been advised, and also a solution of potassium permanganate of 1:3,000 or 1:4,000. These solutions are difficult to handle and stain everything with which they come in contact. Over the compresses moist with aluminum subacetate a piece of oiled silk, cut to hold the dressing in place, is bound. This may be removed at intervals and the dressings again moistened. Such oily substances as carron oil, or oleum lini and aqua calcis may carry infection and should therefore be avoided. When the shreds of epidermis forming the blisters are easily detached they are removed with a forceps and scissors and the whole surface gradually cleared. The exposed surfaces may then be exposed to the air, for an hour at first, later for two or three hours. The surface is then covered with powder and sterile gauze. Little points which ooze and granulate are touched with 3 per cent. silver nitrate solution and are covered with 2 per cent. boric acid in petrolatum to prevent crusting. Under such treatment these burns heal in from ten days to two weeks.

In burns of large areas of the surface of the body, other methods of treatment are often necessary.

Kuss and others have advocated the covering of the burned area with a piece of caoutchouc paper in which holes are cut. Through these the serum drains and the wound is moistened at intervals with salt solution.

Parker (*Jour. A. M. A.*, July 3, 1915, p. 16), after sloughing of the tissue has taken place, covers the wounds or ulcers, especially in burns of the extremities, with strips of adhesive plaster.

After separation of the slough, ribbons of adhesive plaster from 1 to 1¼ inches wide and long enough to cover the area and lap over slightly are placed, leaving no granulations exposed. Its function is to keep in the serum and prevent cells dying from dryness. Over this are placed several layers of gauze to take up the secretion that works out between the strips at various places.

The gauze is changed every day, as it becomes soiled, and every few days the adhesive plaster. This is done by cutting through it with a blunt scissors when it immediately falls away from the moist surface to which it does not become attached. Pus comes away with it. The surface is sponged and a new dressing applied. Parker finds that burned areas so treated granulate smoothly, with little absorption of toxic products and but little pain to patients in changing dressings. Skin grafts placed under such dressings seem to grow as well or better than under gauze dressings. Silverfoil dressings are often very successful.

#### PARAFFIN TREATMENT

This treatment has received considerable trial due to its extensive use in the war zone. It is chiefly applicable to first and second degree burns. The lesions are carefully washed with some antiseptic solution such as hypochlorite or Chloramin-T solutions. They are then dried by blotting with gauze or with a jet of hot air. Then paraffin—one of the paraffins for film preparations mentioned in New and Nonofficial Remedies—is melted and cooled to about 48 C. to 50 C. It

is then sprayed on the wound by a special atomizer or painted on with a fine brush. If there is much pain, the wound may first be covered with sterile liquid petrolatum. The first layer of paraffin is covered with a very thin layer of cotton and the whole held in place by a bandage. Subsequently the dressings are removed, the lesions cleaned in the same manner and again dressed. Sloughs and dead tissue are removed as found at the daily dressings.

#### GENERAL TREATMENT

As has been mentioned, over large, severely burned areas, Reverdin skin grafts may aid epidermization.

An extensive burn practically always is accompanied by some systemic reaction. Patients may be stimulated with caffeine or strychnin, or morphin may be given to relieve the pain.

Gastroduodenal ulceration, with nausea, vomiting, and acute nephritis are not unusual sequellae. In such cases alkalinization of the patient and digitalis will aid in clearing up the condition.

As the patient improves, a good diet, plenty of open air and the administration of iron aid in improving the general condition.

#### PEDICULOSIS

This troublesome condition has long been treated by applications of kerosene oil. The kerosene is applied, the hair covered with a suitable cap for twenty-four hours, then thoroughly washed and the nits removed with a fine comb.

A more recent method of eradicating lice, first recommended by Sabouraud, is the use of xylene. Xylene (xylol of dimethylbenzine) is a colorless liquid coal-tar product. It has a penetrating but not unpleasant odor, and mixes with alcohol and ether, but not with water. It is a strong parasiticide, will rapidly destroy lice, and will penetrate their ova and destroy them. When undiluted, it causes a sharp, burning sensation when applied to the skin; but the pain which it thus causes does not last long, and it does not seem to blister or cause dermatitis. It evaporates when exposed to the air or when applied on the surface of

the body, and is highly inflammable; consequently it should not be used near a fire, or in the evening if the artificial light is other than electric.

Although, as stated, xylene may be used in certain places in certain instances in full strength, it is better to apply it in combination, and a mixture of equal parts of xylene, alcohol and ether is recommended by Faniel as safe and efficient. (*Presse Méd.*, July 22, 1915, p. 268.)

For the removal of lice from the head, cotton is soaked in this mixture and the scalp is thoroughly gone over with this cotton sponge, and all the strands of the hair are drawn through the sponge. Generally with one application, and certainly with two applications of this treatment, all the parasites and nits are destroyed. The disease may be cured in half an hour, even when the hair is long, as in women and girls.

If scratching has caused eczema and scabs on the scalp, these may be softened by the application of petrolatum, and the scabs may be removed later. On these excoriated places the mixture of xylene mentioned above is too strong treatment, and Lane (*New York Med. Jour.*, Oct. 16, 1915, p. 804) recommends in these cases the following:

	Gm. or c.c.
R Xylene .....	4
Petrolatum .....	30
M. Sig.: Use externally as directed.	

The day after this ointment is applied to the scalp it may be washed off, and the strands of the hair treated with the mixture of xylene, alcohol and ether; and then it may be well to apply this ointment once more. As a final treatment of the pediculosis capitis a fine-tooth comb may be run through the hair and the nits thus removed for cosmetic purposes, although the ova have been killed.

In pediculosis of the pubis or axillae the same mixture of xylene, alcohol and ether should be used, and by the same method. It is well, however, to precede the treatment by a warm, cleansing bath, and to follow the treatment by another bath. On the scrotum and vulva and in the deep axillae the xylene mixture is rather



painful for a short time, and should be applied gently and with care, but the burning will last but a few hours. If there are excoriated places on the skin in these regions, the ointment recommended by Lane should be used in place of the xylene solution.

## PLANT POISONING

### Primrose

This poisoning is not infrequent, though generally perhaps it is unrecognized, the condition being called acute eczema.

Sharpe thinks that the dermatitis not infrequently seen on the hands of milkers may sometimes be due to the fact that the poisonous substance of the wild primrose is carried on the udders of the cows.

It has been noted that primrose plants do not readily become infected with insects. Montgomery thinks that the cause of this immunity may be the poison exuded by the plants.

The hands and arms are the parts most attacked by the primrose, and the symptoms are burning, puffing, and at times small pin-point blisters. There is also a good deal of itching.

The primary treatment is to recognize and remove the cause. Magnesium sulphate solutions are generally satisfactory in relieving the inflammation. As is true of all acute skin eruptions, catharsis and a milk and cereal diet will hasten the recovery.

### Ivy, Oak and Sumach

Adelung (*Arch. Int. Med.*, February, 1913, p. 148) found that their poisonous juices are chemically identical, and this poison is nonvolatile. It has been shown that as little as  $\frac{1}{1000}$  of a milligram may produce a dermatitis.

It is now known that the poison of the ivy is of a resinous nature. As it is generally agreed by analysts that the poison is nonvolatile, the assertion that certain susceptible persons may be poisoned by simply passing by the plants remains to be explained. It is certain that neither the pollen nor the plant hairs are toxic, so that direct transmission is the only plausible explanation. Adelung also found that the poison was purely a local one. It is not distributed by the blood.

The latent period or length of time from the infection to the development of the dermatitis is shorter on the parts of the body where the skin is the thinnest, such as the face and the inner sides of the arms and wrists. As is well known, there is a varying susceptibility of individuals, though there seems to be no natural immunity (as shown experimentally). It is a popular idea, however, and seems to be a fact, that some persons may handle the poison ivy, for instance, with impunity. On the other hand, susceptible persons seem to vary as to their susceptibility in different seasons or in different years. This may be entirely due to the variability of the irritant poison.

Adelung found that the rhus plant would yield a pure toxin of about  $\frac{1}{1000}$  of its weight. He believes this toxin has a selective action for the epithelial cells. Experimentally Adelung could not demonstrate that immune bodies were formed in the blood or that there were any immune bodies contained in the blood of an individual who was more or less immune to the poison. Toyama (*Jour. Cut. Dis.*, 1918, 36, p. 157) found the poisonous ingredient to be a substance which he calls "urushiol," which may be isolated from the plants.

#### TREATMENT

If, immediately after exposure to the poison, the parts supposed to be affected are washed with soap and hot water, dermatitis generally will not occur. If it is known that just one small part of the body, as one part of the hand or finger, has touched the poison, the full strength tincture of iodine applied to the part will destroy the poison, according to Adelung.

Protection against poisoning is more or less furnished by oils or fats, as cottonseed oil, smeared over the exposed parts of the body. Any one who is susceptible to such poisoning and knows that he has been exposed, should use, besides the local soap and water, a general hot bath, and should be sure that the possibly infected outer clothing is not again worn until thoroughly brushed and aired.

A strong solution of magnesium sulphate is perhaps one of the best local applications for the dermatitis when it develops. It relieves the itching and limits the inflammation. Oils or ointments containing ichthyol may be used. Many people, however, are very susceptible to lead solutions unless they are very weak, and also if the skin is broken too much absorption of lead may occur. As just advised, the magnesium sulphate solution is probably the best treatment. As soon as the acute inflammation is over, any simple talcum powder, or powdered corn starch, is very soothing to the skin.

### CHLOASMA

The mechanism regulating pigment formation in the skin is entirely unknown. That there is such a mechanism is indicated by the disturbances of pigmentation which appear without any demonstrable cause, and which occur in association with pregnancy, with diseases of the suprarenal glands, and occasionally with various tumors in the abdomen and pelvis. These cases of chloasma associated with pelvic and abdominal conditions are vaguely explained as being due to disturbances of the abdominal sympathetic nervous system. They are undoubtedly due to disturbances of some mechanism in the abdomen and pelvis, but that it is the sympathetic nervous system is in large part a surmise.

In the face of so obscure an etiology, there is no rational method of systemic treatment. The most that can be done is to make an effort to overcome such uterine and other pelvic or abdominal sources of irritation as may be manifest. But such systemic treatment directed to the relief of chloasma is usually entirely futile.

We are left to local methods of treatment, and the best that such treatment can do is to get rid of the pigment temporarily. The increased pigment in these patches is situated in the lower part of the epidermis, and this pigment can be removed by the use of applications which cause deep exfoliation of the epidermis. This escharotic treatment is best referred to the skin specialist.

## BORIC ACID IN SKIN DISEASES

Boric acid according to Montgomery (*Jour. A. M. A.*, 1915, lxiv, p. 883) has a very extensive use in skin diseases but is almost always used as an adjuvant.

*Acne*.—An initiatory soaking with a hot boric acid solution is often of great benefit in the local treatment of acne. For this purpose it is desirable to apply the solution hot and to use a large quantity of it, so that the heat will be retained for a considerable time. Three heaping tablespoonfuls of boric acid powder are added to the usual quantity of water used in washing—about 3 quarts. This makes approximately a 3 per cent. solution. The patient should then sit, leaning over the bowl, and soak the face well with towels wrung out of the hot solution. As the solution grows cooler, more hot water may be added. It is often advantageous so to soak the face for ten or fifteen minutes. It softens the epithelium and acts as an excellent detergent, removing the grease and many of the micro-organisms, and decidedly increases the efficiency of a resorcin or sulphur application.

*Furuncle*.—In the primary stage of active congestion in furuncles, Montgomery suggests that moist heat together with a nonirritating antiseptic are the topical therapeutic indications. These indications, he says, may be met by employing gauze dipped in hot saturated (4 per cent.) solution of boric acid, and enveloping with oil silk to retain the moisture and the heat. This is similar to a poultice, but is not so good, as it is not so bland and does not retain the heat so well; it, however, is often sufficient, and is easier to apply. An admirable poultice for this purpose is made by mixing boric acid powder with starch paste. The preparation of this will be taken up later.

*Styes*.—The styne is a form of furuncle of the eyelid. It has been pointed out that styes may be related to seborrhea of the scalp. In the treatment of styes, Montgomery orders persistent bathing and soaking for half an hour twice a day with warm saturated solution of boric acid, and after each soaking the rubbing in of a salve of 1 per cent. red mercuric oxid in vaselin.



Suppurative folliculitis of the vibrissae of the nares is another pyogenic affection in which boric acid may be employed with advantage. This folliculitis is a most tantalizing affection, and is often combined with cracking of the mucous membrane at the anterior angle of the nares, constituting one of the causes of red nose. These lesions may also furnish a convenient entrance for the streptococci. An efficient manner of treating this folliculitis is to set before the patient a tin cup of saturated solution of boric acid, kept hot by placing it over the flame of a spirit lamp. The patient takes pledgets of absorbent cotton, dips them in the hot solution, and pushes them into the affected nostril, repeating this during ten or fifteen minutes till the tissues are well softened, and the crusts softened and loosened. Calomel, 12 per cent. in vaselin, is then well rubbed in. This procedure may be repeated two or three times a day. Care must be taken both to soak thoroughly and anoint the fossa behind the nose tip, as these hollows are a favorite residence for germs in this affection. Epilation may or may not be necessary.

*Impetigo*.—To remove the crusts in impetigo Montgomery applies to the lesions a boric acid starch poultice. The making of this poultice is a simple matter, but it is often the simple matters that are the most neglected. It is made in the following manner:

Take ordinary, common, lump laundry starch and pulverize it. This pulverization is to be done before measuring. Dissolve one slightly heaping tablespoonful of the pulverized starch in two tablespoonfuls of cold water. Add to this one coffee cupful of boiling water, stirring rapidly until the mixture is a thick paste. To this paste add a tablespoonful of boric acid, free from lumps, and stir well until thoroughly mixed. Fold the warm jelly between layers of thin muslin or cheesecloth, and apply as hot as can be borne.

A good poultice should not be too thin or it will dry, nor too bulky, or it will run; it should be slightly less than a finger thick. In order to prevent the borders drying and sticking to the surface, they may be greased with vaselin, oil or zinc oxid ointment.

This poultice is not gummy like a linseed poultice, is cleaner looking and retains heat just as well. Besides the foregoing use, such a poultice has a multitude of applications, sometimes being employed hot, sometimes cold, as pointed out by Sabouraud.

When, by means of this poultice, the crusts are softened and loosened, they may be gently removed. This removal is often best accomplished by rubbing in a salve containing an appropriate antiseptic, such as ammoniated mercury. The following ointment is an excellent one for the purpose:

	Gm. or C.c.	
℞ Ung. hydrargyri ammoniati..	15	$\frac{3}{4}$ ss
Ung. zinci oxidi.....	30	$\frac{3}{4}$ i

M. Sig.: Use twice a day both to clean and dress the affected surface.

The real efficient antiseptic in the above is the ammoniated mercury, a remedy familiar to every skin clinic in which naturally streptococcic infections are among the daily visitors. The 10 per cent. ointment of the Pharmacopeia, however, is too stimulating, and the zinc oxid ointment both dilutes it and modifies its asperity.

As a general lotion for more widespread use in very scattered pyogenic infection of the skin, a saturated solution of boric acid in dilute alcohol serves admirably. It is harmless, it is clean and does not stain, and is not disagreeable in either appearance or odor, and because of the alcohol cutting the fat of the cutaneous surface, both the alcohol and the boric acid are permitted to act effectively as antiseptics.

*Perleche*.—In this infection of the mouths of infants, pledgets of cotton wet in warm boric solution should first be industriously sopped into the corners of the mouth where there is cracking and a characteristic gray veil-like covering. If possible, they should be drawn across the corners of the mouth saddlewise and left there. After this the ointment of ammoniated mercury and zinc oxid above mentioned should be rubbed in, being careful that too much absorption does not occur.

*Paronychia*.—In paronychia or felon, both as an abortive measure and as an antiphlogistic antiseptic measure, a dressing of a combination of boric acid and liquor alumini subacetatis may do excellent service. A lotion is made as follows:

	Gm. or C.c.	
R Liq. alumini subacetatis.....	30	3 i
Acid boric sol. sat.....	300	fl 3 x

M. Sig.: Employ warm water to bathe the finger, and also as a wet dressing.

Gauze soaked in this solution is wrapped about the finger, and then an amply fitting rubber finger-stall is drawn over it and retained by a not too tight bandage.

Liquor alumini subacetatis is among the best of the mild antiseptics, and is gradually coming into favor in surgical clinics. It must be carefully prepared, and should be diluted about ten times. The water employed in its dilution is not an indifferent matter, as that containing carbonates throws down a heavy gelatinous precipitate of aluminum hydroxid. As the foregoing prescription is put up by a druggist, and with distilled water, this mischance is avoided.

Montgomery believes that, used either alone or combined with other powders, boric acid is very valuable in many discharging diseases of the skin. An excellent powder is made of equal parts of boric acid and talc, or of equal parts of starch, zinc oxid and boric acid.

The boric acid ointment of the Pharmacopeia contains about 8 per cent. of boric acid, while Lister's ointment is much stronger—about 16 per cent. Boric acid ointment is an excellent nonirritating preparation with a multitude of uses. It is an ointment that, more generally than any other, is well prepared, and this is a point of importance when the druggist who is to put up a prescription is not known, as ointments are often wretchedly made. In seborrheic conditions this ointment will sometimes agree when those more usually employed fail.

## PICRIC ACID IN SKIN DISEASES

Wilcox (*Archives of Pediatrics* 30:877, 1913) believes that as an aid in the relief of discomfort in

skin lesions as well as in their cure, picric acid has proved its worth. The drug is safe and easy to handle, the only drawback being the permanent staining of everything with which it comes in contact.

*Eczema.*—Better results were obtained in the acute than in the chronic eczemas; most striking was the improvement seen in the acute cases having profuse exudation, excoriation and crusting. In the milder cases an aqueous solution painted on several times daily and allowed to dry was used, while in the more severe cases wet dressings of picric acid were applied, held in place by a facial mask. Lessening of the itching and pain attendant on the inflammatory condition was almost immediate. Reduction in the serous exudation and softening of the crusts were equally prompt. Improvement in the induration was rapid, as was the subsequent epithelialization. Such a rapid relief of the suffering attendant on this distressing condition was not obtained by any other means. Picric acid alone was not as efficacious in the subacute and chronic types of the disease; it was found, however, that the curing of the lesions was hastened materially by treatment initiated by two or three days' application of the picric acid solution. The effectiveness of the usual ointments, containing zinc, tar, salicylic acid, calomel, mercury, etc., was much greater than without this preliminary treatment.

*Intertrigo.*—Intertrigo was treated with picric acid. The solution was painted on the surfaces of the skin involved and they were kept from coming in contact by thin layers of absorbent cotton. In the more severely infected cases wet dressings were used. Cures were effected in about half the time taken on similar cases treated with ichthyol solutions. The use of picric acid in intertrigo was so satisfactory that a bottle of the aqueous solution is now part of the regular equipment of the dressing carriage, and the nurses, in the routine of changing the babies' napkins, apply it whenever the buttocks appear red or irritated.

*Erysipelas.*—Results in the treatment of erysipelas were not uniformly successful. In certain ways they were, however, more satisfactory than the results obtained by the use of any other method. The dis-



comfort and pain attendant on the condition were relieved more quickly and the edema disappeared rapidly. In several cases desquamation in cast-like masses followed the use of picric acid, leaving a healthy normal skin beneath. A reduction in the temperature of these patients was the rule, occurring with or without marked improvement in the local condition.

*Herpes Labialis*.—In herpes labialis a more rapid drying up of the lesion and fewer extensions of the trouble were obtained with picric acid than with any other method used.

# SYPHILIS AND DISEASES OF THE GENITO-URINARY TRACT

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## SYPHILIS

The finding of the organism of syphilis, the *Spirochaeta pallida*, in the initial lesion is, of course, the conclusive evidence of syphilitic infection. Antiseptics applied, especially mercurials, make the finding of *Spirochaeta pallida* difficult or almost impossible. No mercurial dressings, or better still, no antiseptics, should be applied to any lesions until the examination for *Spirochaeta pallida* has been made, and if any have been used, it should be made a routine to irrigate thoroughly with physiologic sodium chlorid solution and to apply a wet dressing of the solution for twelve hours or more before examining for *Spirochaeta pallida*. The primary lesion should be wiped clean with a sponge wet with physiologic saline solution. From the clean oozing surface which remains a drop of serum is taken and placed on a slide. The organisms may then be sought in the hanging drop by means of dark field illumination or in a stained specimen. The organism is a regular spiral organism of from 6 to 15 microns in length, and has from 3 to 25 turns. The average length is about twice that of a red blood corpuscle. The Wassermann test should be made in all suspected cases. If a Wassermann test is positive it should immediately be confirmed by another test perhaps made by another laboratory specialist. Usually the test is negative during the first week of the disease. If, however, the spirochetes can be demonstrated in the primary lesion, treatment should not be delayed. If the lesion is clinically chancre Wassermann tests should be repeated at intervals of a week for at least a month to see if a positive will not be secured.

## EARLY TREATMENT

The patient should be instructed regarding the observance of good general hygiene. A nutritious simple diet, total abstinence from alcohol, a proper

amount of fresh air and physical exercise are in this, as in all disease conditions, important factors in the treatment.

#### THE CARE OF THE PRIMARY LESION

It is no longer considered good treatment to cauterize a chancre. Ordinary cleanliness and protection should be used. When the location of the chancre is such that physical deformity will not accompany its excision, this may be considered. Until the search for the spirochete is completed the lesion should be merely covered with a dressing moistened with physiologic saline solution. After a positive diagnosis is made the chancre may be treated with a 33 per cent. calomel ointment applied twice daily for a week by inunction; in the interval it may be covered with gauze and some bland ointment. Reasoner has shown that the spirochete is killed promptly by a lather of soap.

#### ARSPHENAMIN AND NEOARSPHENAMIN

The use of arsphenamin and neoarsphenamin—names adopted by the Federal Trade Commission for drugs formerly known as salvarsan and neosalvarsan—early in the disease is productive of an early disappearance of external lesions and if sufficiently early will often prevent the appearance of such secondary signs as the eruption, sore throat, alopecia and systemic disturbances of secondary syphilis. The dose of arsphenamin should be graduated to the weight of the patient. Ordinarily for an adult male it is 0.4 to 0.6 gm. of arsphenamin given at five day intervals until three doses are taken; after that at intervals of a week for five more doses, making a total of eight doses of arsphenamin in a little more than six weeks. This is then followed with a treatment with mercury. After a rest period of six or eight weeks it is desirable to repeat this course of treatment regardless of the results of the Wassermann test. The patient should then be watched, having frequent Wassermann tests, for any evidence of relapse.

The arsphenamin should be given preferably intravenously, although this drug properly prepared has also been given intramuscularly, subcutaneously and

even orally. The technic should be extremely careful. Before giving the drug the urine of the patient should be examined for evidence of kidney irritation. The patient's stomach should be empty. He should remain quiet for the remainder of the day, and should take no food until the next morning after the injection. As reactions frequently occur and as these are usually treated with injection of from 5 to 10 minims of the 1:1,000 solution of epinephrin, it is sometimes advisable to inject a small dose of epinephrin before starting the treatment. It has also been suggested that the giving of liberal doses of sodium bicarbonate before injection of the salvarsan is a fairly efficient preventive of reactions.

The injection of this drug intravenously is a minor operative procedure. It should be carried out with strict asepsis. The apparatus, the physician's hands, the site of injection, should all have been surgically prepared and be surgically clean. The drug is dissolved in 50 c.c. of hot water, yielding a strong acid solution, which is then neutralized and diluted before injection. A 15 per cent. solution of sodium hydroxid is added, drop by drop, until the arspenamin is precipitated and again dissolved, at which point the solution will be slightly alkaline. The mixture should not be shaken too vigorously, for fear of oxidizing the arspenamin, which is a relatively unstable drug. The solution is then filtered through wet sterile cotton into a graduated container. Water is then added to produce the proper dilution. In the meantime, the patient's arm has been cleaned, a tourniquet applied to engorge the veins, and the vein entered with the needle. The adapter fitted to the tube from the graduate containing the drug is then fitted to the needle and the solution allowed to flow in gradually under very low pressure.

The neoarsphenamin is more soluble and is most frequently injected by dissolving the contents of the ampule in 10 c.c. of freshly distilled water, at room temperature, directly in the barrel of a large syringe and then injecting directly into the vein. The solution of this drug is neutral and requires no special treat-



ment. This drug is generally believed to be of less potency than any of the preparations of arspenamin.

#### TOXICITY OF ARSPHENAMIN

Schamberg, Kolmer and Raiziss, after extensive experimental studies of arspenamin preparations, find that failure to neutralize solutions of arspenamin with alkali leads to an increase in toxicity; a moderate excess of alkali does not increase the toxicity, but may have untoward effects. Sterile freshly distilled water appears to possess advantages over sterile stale or non-distilled water, although the difference was not pronounced. The toxicity of the arspenamin in alkaline solution increases rapidly, due to oxidation, and the drug should be used promptly after its preparation. All of the preparations of arspenamin now being sold in the United States are subjected to biologic toxicity tests both by the manufacturers and by the Hygienic Laboratory of the United States Public Health Service, and if the physician's technic is good they may be used with confidence.

Martin (*Jour. A. M. A.* 74: 1218, 1920) has analyzed some of the factors responsible for these reactions. One should note any departure from the normal lemon-yellow color of the brand of arspenamin being used, and then immerse the ampule in 95 per cent. alcohol for fifteen minutes to detect obscure cracks. Cracked ampules or ampules that contain discolored arspenamin are to be rejected, the substance having become oxidized. One is further directed to prepare individual solutions, and when this is not practical, not to prepare more solution than can be disposed of within half an hour. Using the syringe-container method, and allowing six minutes for each 0.5 gm. of arspenamin in solution, limits the number of ampules that may be used at one time to five. The sooner the solution is disposed of, the less danger of oxidation.

"Using the directed technic for one brand of arspenamin while preparing the solution of another will, in some cases, cause reactions. Salvarsan (Metz) calls for freshly distilled water of not more than room temperature; diarsenol requires warm, freshly distilled water; and arsenobenzol is to be dissolved in boiling

hot, freshly distilled water. Salvarsan becomes oxidized when dissolved in hot water. The directions call for freshly distilled water or physiologic sodium chlorid solution, prepared from chemically pure sodium chlorid—not from table salt. It is directed that normal sodium hydroxid (4 per cent.) or 15 per cent. solution be used to neutralize and alkalize arspenamin in solution. Faulty preparation with impure or altered sodium hydroxid, or contaminated distilled water, may cause reactions.

“Neutralizing arspenamin, which is a dihydrochlorid salt, requires a definite amount of sodium hydroxid to render it slightly alkaline and suitable for use. A large percentage of reactions resulting when technic is not strictly followed are due to hypo-alkalization, while hyperalkaline solutions, due to faulty measuring of sodium hydroxid solution, cause reactions at times. A graduated pipet or buret is recommended to be used, the certainty being a normal-sized drop and accurate measure. Arspenamin is precipitated as a basic salt by sodium hydroxid; it requires a definite amount to redissolve the precipitate, changing the basic salt to a monosodium salt, the solution being just alkaline to litmus paper. On further addition of a definite amount of sodium hydroxid, a disodium salt is formed which is completely soluble in water. The basic precipitate and monosodium salt will cause reactions, the disodium salt in solution, properly diluted and filtered, being suitable for use.”

All manufacturers agree that solutions should be of room temperature. Injecting too cold solutions into the circulation will induce chill reactions. Too rapid giving of the solution, particularly in high concentration, will cause reactions in some instances. One is advised not to give more than 0.1 gm. of drug (30 c.c. of solution) in two minutes; the gravity method is the one advised; the rate of flow is controlled by the size of the needle (No. 18 or 20 B. & S. gage) and the height of the column of fluid. The syringe-container method is favored by many operators, and while not as “fool proof” as the gravity method, an expert can handle difficult work with greater precision.

Giving too large a dose of arsphenamin at the beginning of a course of treatment accounts for some reactions. Lack of preliminary preparation for treatment—a laxative the night before, and a light breakfast four or five hours before operation—is sometimes a cause. Every patient should be given a careful physical examination to determine organic or functional impairments, as findings may limit or contraindicate arsphenamin treatment. When two or more reactions occur from a multiple ampule solution, in the majority of instances the fault will be found in the technic of preparing the solution, and the usual cause will probably be hypo-alkalinity.

#### FACTORS ATTRIBUTABLE TO THE PATIENT

Both arsphenamin and the technic in preparing its solution having been excluded, factors attributable to the patient are to be considered. Tissue susceptibility to arsphenamin medication includes allergic idiosyncrasy, an inherited dominant susceptibility to arsphenamin medication; anaphylaxis, protoplasmic sensitization from repeated doses; blood synthesis reactions, in which arsphenamin becomes altered or precipitated from causes not understood, or ascribed to excess of carbon dioxid in the blood, or faultily prepared arsphenamin solutions; and the nitritoid reaction, ascribed to the action of arsphenamin in destroying spirochetes and liberating large quantities of bacterial protein to which the tissues have become sensitized. The Herxheimer reaction is attributed to the stimulating activity of nonsterilizing doses of arsphenamin.

#### MERCURY

The inunction treatment is an efficient method of attacking the disease if it is done in an efficient manner. As a general rule the patient cannot be trusted to conduct this treatment alone. A course of inunction treatments may consist of 20, employing 4 grams (a dram) of the official mercurial ointment, rubbed well into the different parts of the body, once a day, the treatment lasting at least 15 minutes. A turkish bath or "body bake" at least once a week is advisable.

Another method of administering mercury, probably most popular in recent years, is that by intramuscular injection. The most favorable site is usually the gluteal region. The lower part of the buttock should be avoided in order that the patient may sit without undue discomfort; the center of the gluteal region should be avoided because of the danger of puncturing gluteal vessels or the sciatic nerve. Of course the two sides should be used alternately in giving a series of injections.

The best syringe for these injections is one made entirely of glass, of small caliber, and graduated to fractions of a minim, such as is made for tuberculin injections. The needle should be from  $1\frac{1}{2}$  to 3 inches in length. Steel needles are much cheaper than those of iridoplatinum, but are likely to be corroded by soluble mercurial salts.

The fluid is drawn into the syringe, and any air bubbles carefully expelled. Then the skin having been properly cleansed, the needle is thrust through it in a perpendicular direction so as to reach the required depth at a single stroke. Next assure yourself that the point of the needle does not lie in a vein, by detaching the barrel and watching the lumen for a moment. If blood flows through the needle, make another puncture; otherwise replace the syringe and proceed with the injection. It is not necessary to massage the injected mass. The most careful practice is to make the injections with the patient lying down. The dressing of the puncture is necessary only when bleeding occurs.

The preparations of mercury used in this way include both soluble and insoluble salts. The most useful soluble salts are the chlorid and the succinimid. The average dose of the chlorid and succinimid is 0.015 gm. or  $\frac{1}{4}$  grain. The insoluble salts most frequently used are the basic salicylate, calomel and gray oil, the latter being an emulsion of metallic mercury in an oily vehicle. It is most important that all these substances be pure and neutral.

The drugs may be purchased from any good pharmaceutical house in ampules ready for injection. Several approved preparations are listed in New and Nonofficial Remedies.



Injectations of soluble salts should be used when rapid mercurialization is required. They may be used at the beginning of treatment. The insoluble salts are indicated in the routine treatment of most cases. Calomel is usually more effective in urgent cases, but it causes too much pain to be used in ordinary cases, in which the salicylate and the gray oil are preferable.

In beginning treatment it may be necessary to give an injection every day for a few days; but afterward a weekly injection will be sufficient.

Among the disadvantages of this form of treatment should be noticed the fact that it is more or less painful. With the soluble salts the pain begins at once and lasts for from 1 to 6 hours. With insoluble preparations it begins within an hour, and lasts from 2 to 5 days. The pain is most severe after calomel, and least so after gray oil, which is often entirely painless.

Hard masses of exudates, known as nodes, sometimes form about the injected mass. These often retain a portion of the injected fluid, which may subsequently be suddenly absorbed.

Embolism sometimes results from the injection of the fluid into a vein. Although this has rarely, if ever, proved fatal, it should be avoided. Abscesses rarely occur if the injections are properly administered.

Whatever method of administering mercury is adopted, certain general hygienic rules must always be observed. The teeth must be put into good condition and the mouth must be kept clean. Chewing tobacco must be absolutely interdicted. Moderate smoking may be allowed to those who are accustomed to the use of tobacco, unless some special condition renders it advisable to discontinue its use entirely.

#### IODIDS

Iodids are used in tertiary syphilis chiefly. While the iodid of potassium is the salt most generally used, the sodium iodid is perhaps preferable, since the sodium element is not as debilitating to muscle tissue as is the potassium. This is especially true of the cardiac muscle. Hence when large doses must be given, or when it must be given for a long time, the

iodid of sodium should be preferred. This salt also sometimes seems less likely to disturb the stomach.

The symptoms of iodism should be avoided if possible. These symptoms are coryza, frontal headache, reddening of the eyelids, a strong, metallic taste in the mouth, sometimes a profuse flow of saliva and gastric indigestion. It is unimportant whether the iodid is ordered largely diluted or in saturated solution, but it should never be ordered in any syrupy, nasty mixture. It is preferably administered in milk or in an alkaline water. It is generally best taken after a meal, theoretically best an hour after meals, as it slightly inhibits digestion. When an iodid is administered the yellow iodid (the protoiodid) of mercury should not be the salt selected for simultaneous administration, as it is likely to be chemically changed into the biniodid (red iodid) of mercury, which salt would then be present in a poisonous quantity. The following prescriptions may be used:

	Gm.	
R Sodii iodidi.....	25	3 viiss
Aquae destillatae, q. s. ad		or
saturandum .....		q. s. ad sat.

M. Sig.: Five drops with milk or water, three times a day, after meals. The dose should be gradually increased until the amount given is deemed sufficient.

Each minim of this solution represents a grain of the drug. The statement frequently made that a drop of saturated solution of potassium or sodium iodid represents a grain of the drug is apt to lead the physician into error, as the size of a drop varies with the size and nature of the container from which it is dropped.

Or:

	Gm. or C.c.	
R Potassii iodidi .....	10	or 3 iiss
Aquae .....	100	fl̄ 3 iii

M. Sig.: One-half a teaspoonful, in milk or water, three times a day, after meals.

The iodids have been given in enormous doses, especially where gumma of the central nervous system has been diagnosed. It is a question whether such large doses are justifiable and even whether such large doses

are of advantage. It is probable that ordinary fair-sized doses can do as much chemical and biologic good as any dose however large in causing resorption of connective tissue formations, the blood and cells being able to absorb and utilize only a certain amount of iodine. In other words, enormous doses are illogical and are probably rapidly passed out of the body by the excretions.

Jobling and Peterson (*Journal A. M. A.*, Nov. 28, 1914, p. 1931), say: "Clinical experience teaches us that in the tertiary stage of syphilis iodine is almost a specific in bringing about the amelioration of symptoms, and the disappearance of lesions, and yet little is known concerning the means by which these results are obtained.

"As experimental work and clinical observations have demonstrated that the iodids do not destroy the infecting organism, we must assume that the results obtained are due to the power the iodids possess of causing resolution of the lesions present. That this actually occurs will be attested to by every clinician of experience. It is due to the fact that the unsaturated fatty acid radicals which inhibit autolysis have become saturated with iodine. As soon as this occurs, the ferments which are present, or which may be brought in, become active, autolysis takes place, and the necrotic tissue is absorbed. Here, also, the local action of the ferments is made less difficult by the reduction of the anti-enzyme in the circulating blood. It must be borne in mind that the iodids are not as effective in the earlier stages of syphilis, when necrosis of tissue is not so evident.

"If the above interpretation of the action of iodine is correct, it gives the clinician a rational idea of what he is accomplishing when he gives iodids to a patient in the tertiary stage of syphilis. According to this view, iodine neutralizes the action of the agents which prevent resolution and absorption of the diseased or necrotic tissue, and at the same time lays bare to the action of the real germicidal agent the infecting organism which previously had been protected by the necrotic tissue. With the exposure of the infecting

organism, such agents as mercury and salvarsan would be much more effective."

#### CARE OF THE MOUTH

During the mercurial treatment the patient should drink plenty of water to promote the activity of all the organs of excretion. The mercury will probably soon cause sufficient or even perhaps too frequent movements of the bowels. The care of the mouth, teeth and gums is important, and the patient cannot be too carefully instructed in this matter. Any alkaline wash, or, if there are any erosions, peroxid of hydrogen applications, or a mouth wash of alcohol one part and water three parts, or a potassium chlorate mouth wash, and occasionally tannic acid washes and gargles are useful. Ulcerations in the mouth and throat will often heal rapidly after one or two applications of a 25 per cent. solution of nitrate of silver. Without ulceration in the mouth and throat the mucous membrane may be kept healthy by a thorough cleaning of the teeth two or three times daily, and the cleansing of the mouth and throat with alkaline solutions.

An excellent dentrifice has been suggested by Fantus :

#### LIQUID DENTIFRICE

	Gm. or C.c.
R Castile soap, dried and granulated	6 00
Benzosulphinid .....	0 20
Basic fuchsin .....	0 002
Oil of cassia.....	0 50
Oil of peppermint.....	0 50
Oil of cloves.....	1 00
Alcohol .....	75 00
Water .....to make	100 00

A few drops added to water to be used as a mouth wash.

It will be noted that, excepting for the volatile oils present, antiseptics and disinfectants are conspicuous by their absence. As is well known, it is impossible to disinfect the mouth. Mere bacteriostatic (germ growth inhibitive) influence can be of value only as long as the agent is present; and the time that one is willing to keep the mouth full of fluid is limited. The chief virtue of mouth wash preparations lies in their esthetic qualities :



their pleasant appearance, odor and taste, which make one use them with a greater degree of pleasure and therefore more faithfully.

The patient should be thoroughly instructed as to the danger of his infecting others and the manner of such infection—as by napkins, towels, drinking cups, spoons, forks, or kissing. Such instructions should be most explicitly given if there are mucous patches in the throat.

#### SYPHILIS OF THE NERVOUS SYSTEM

Swift and Ellis (*Archives of Internal Medicine*, September, 1913) suggested what is known as the auto-serosalvarsan method of treating syphilis of the nervous system. Briefly the method consists in injecting salvarsan intravenously, waiting one hour, withdrawing 40 c.c. of blood, allow it to coagulate, then centrifugalize. The following day pipette off 12 c.c. of serum, and dilute with 18 c.c. of normal saline. Heat to 56 C. for one half hour. After lumbar puncture withdraw the spinal fluid until a pressure of 30 mm. is reached. The barrel of a 20 c.c. all glass syringe is connected to the needle by means of a rubber tube about 40 cm. long. The tubing is then allowed to fill with cerebrospinal fluid, so that no air will be injected. The serum is then poured into the syringe and allowed to flow slowly into the subarachnoid space by means of gravity. At times it is necessary to insert the plunger of the syringe to inject the last 5 c.c. of fluid.

In addition to the Swift-Ellis method there have been used serum to which small quantities of salvarsan have been added; neoarsphenamin in small quantities and weak concentration and mercurialized serum. With the former two methods severe reactions have occurred and patients have developed bladder paralysis and in some cases a fatal issue was the outcome. The danger of injecting mercurialized horse serum lies in the possibility of producing a general anaphylactic state. Fordyce, Sachs, Barbat, Corbus and many others are inclined to believe that just as good results can be achieved by intensive intravenous treatment and spinal treatment. It has also been suggested that simultaneously with the injection of the arsphenamin

in the blood a quantity of spinal fluid be withdrawn in order to cause more of the drug to pass into the spinal fluid from the blood by whatever physiologic process this takes place.

### ACUTE GONORRHEA

While, theoretically, the most sensible treatment in this unfortunate common disease would be to place the patient in bed, on a milk diet combined with bland alkaline drinks and free catharsis, it is obviously impossible, in the majority of instances, to carry out such treatment. Consequently it should be aimed to get as near as possible to such general treatment.

### GENERAL TREATMENT

*Exercise.*—The patient should be forbidden all violent exercise. Running, swimming, dancing, gymnastics, and extreme exertion of any kind should be forbidden.

*Suspensory.*—Rest is obtained by the wearing of a suitable suspensory bandage. The penis should be held toward the abdomen. Ordinary suspensory bandages do not do this. The patient should be commanded to avoid sexual intercourse and all sexual excitation.

*Diet.*—All substances which may bring on constipation or excite the generative organs should be forbidden. Alcohol, coffee, tea, highly spiced foods and condiments, very acid or salty dishes, and various shellfish should be forbidden. The use of tobacco in small amounts by those habituated to its use may be continued, but excess is certainly contraindicated.

*Cleanliness.*—The patient should be instructed to maintain scrupulous cleanliness. The penis should be covered with a clean dressing after each micturition. The patient should avoid frequent handling of the genitalia. After such handling the hands should be washed thoroughly, and the eyes should not be touched because of the danger of gonorrheal conjunctivitis.

*Fluids.*—The patient should drink freely of water. One of the best methods of diminishing pain during micturition is to increase largely the quantity of urine.

It may be necessary to influence the reaction of urine, making it either alkaline or acid as conditions indicate.

The best alkalinizers of the urine are the well known potassium salts, the acetate, bicarbonate and citrate, and every physician has his favorite combination of these drugs. Any one of these salts is efficient if given in sufficient doses, though many physicians think a combination is better. The acetate is perhaps the most active alkali of the three, the bicarbonate the most disagreeable to take, and the citrate the pleasantest.

The urine is more readily rendered alkaline by the administration of the alkali directly after a meal, at which time the urine is the nearest to neutral on account of the production of hydrochloric acid in the stomach. The amount of an alkali that should be administered cannot be determined except by examination of the urine; in other words, if the object is to render the urine alkaline, enough should be given to cause that condition. Any of the following combinations are satisfactory:

	Gm. or C.c.	
R Potassii citratis .....	40	or ʒ ii
Aquae .....	200	ʒ viii

M. Sig.: Two teaspoonfuls, in water, three times a day, after meals.

[The water may be flavored with an aromatic, as peppermint, spearmint, wintergreen, or cinnamon, if desired.]

It will often be necessary to administer the above dose more frequently than three times a day. Also, as an adjunct, it is sometimes advisable to have the patient drink several glasses of artificial or natural vichy, or some other alkaline water, during the day.

Or:

	Gm. or C.c.	
R Potassii acetatis.....		
Potassii bicarbonatis.....āā	10	ʒ iii
Potassii citratis .....	20	or ʒ vi
Aquae cinnamomi .....	200	ʒ viii

M. Sig.: Two teaspoonfuls, in water, three times a day, after meals.

Alkalies should not be pushed long if there is considerable mucus coming from the bladder, or if there is bladder irritability, for it must be remembered that the bladder mucous membrane is accustomed to an acid

secretion, and a continuous alkaline urine sooner or later causes irritability of the neck of the bladder, frequent micturition and even tenesmus. Also, if the urine becomes at all ammoniacal, the irritation of the bladder is made worse by alkalies, and the likelihood of deposits in the bladder is increased.

#### URINARY ANTISEPTICS

To render the urine antiseptic there are no better drugs than salol (phenylis salicylas) or hexamethylenamin.

As soon as the first acute symptoms are over, the alkali should be stopped, as it is not well for a healthy condition of the mucous membrane of the bladder to keep the urine alkaline for any considerable time. At this time it seems well to begin the administration of salol or hexamethylenamin, as thought best. If there is any irritation of the kidneys, salol, on account of one of its decomposition products being phenol, should not be used, phenol being irritant to the kidneys. If it is administered, it is well given as follows:

	Gm. or C.c.	
R Phenylis salicylatis.....	6	or 3 iss
Fac capsulas siccas, 20.		
Sig.: A capsule every four hours.		

Hexamethylenamin, to be effective, must reach an acid medium, or its formaldehyd will not be released and its antiseptic action will be nullified. It may be given in a dosage of 5 to 10 grains three or four times a day in half a glass of water.

#### COPAIBA AND SANTAL

These drugs have long been used in gonorrhea for their action on the mucous membrane of the genital tract. They are indicated apparently for subacute and chronic gonorrhea rather than for the acute condition. As soon as posterior urethritis has developed, which occurs in the majority of cases of gonorrheal urethritis, one of the balsams is indicated, unless there is vesical irritation, as shown by great frequency of urination with small amounts of urine passed. Santal oil seems to be one of the best preparations and may be administered as follows:



℞ Capsulas olei santali flexibiles. .āā | ℥ x  
No. 25.

Sig.: A capsule three times a day, after meals.

If there is no diminution in the amount of pus in the second glass of the two-glass test, and there are no symptoms of overaction of santal wood (viz., no pains referred to the ureters, or lumbar pains, and no special indigestion), two of these capsules three times a day may be taken.

It should be emphasized that no patient with gonorrhea can be well treated unless at each office visit he passes urine, that has been retained for at least three hours, into two glasses, he dividing the amount as nearly equally as his judgment permits. The washout from the urethra can thus be examined in the first glass, and the urine from the bladder and posterior urethra be examined in the second glass, and the conclusions thus arrived at will many times decide the treatment that is needed.

All balsam treatment may be stopped as soon as the posterior urethritis is cured. If, on the other hand, the posterior urethritis does not improve, the balsam may be increased in amount, or, if the posterior urethritis tends to become chronic, local posterior urethral treatment is indicated. It is also wise to demonstrate to the patient that, although the anterior urethral discharge may have ceased, he is not well until the posterior urethra is healed.

If it is preferred to use hexamethylenamin as a bladder and posterior urethra germicide treatment (and if the bladder becomes actually infected there probably is no better treatment), it may be given as follows:

	Gm. or C.c.	
℞ Hexamethylenaminae .....	6	or 3 iss
Fac chartulas, 20.		

Sig.: A powder, in a glass of water, four times a day.

#### LOCAL TREATMENT

The local treatment of gonorrhea involves the question of irrigations or injections. American genito-urinary specialists do not, in general, believe that irrigation is often indicated in anterior urethritis. It certainly appears not justifiable to give any great pres-

sure to the delicate urethral membrane, as occurs by any irrigation method. Such irrigations may not only force the gonococci into deeper tissues as well as into the posterior urethra and perhaps bladder, but may so injure the mucous membrane as to cause long protracted chronic inflammation and strictures.

On the other hand, many times injections are badly done and lead to complications, such as prostatitis, cystitis and vesiculitis. To avoid these accidents the patient should not be given any syringe which holds more than 5 or 6 c.c. The patient should urinate before the injection. The meatus and glands should be washed and the fluid injected first should be allowed to run out. The patient then reinjects, closes the meatus, holds the fluid five minutes and then allows it to run out.

The number of substances used for such injections is legion; chief, however, are silver nitrate and the organic silver preparations. Silver nitrate is used in a strength of 1:1,000.

The silver compounds that may be used for this purpose are albargin, argentamin, argonin, argyrol, hegonon, novargon, protargol, sophol, cargentos, collargol and electrargol. All of these preparations are included in New and Nonofficial Remedies. The strength of the solution used varies with the preparation, argyrol from 5 to 20 per cent., protargol, 1 to 2 per cent., etc.

The patient, as has been stated, should be carefully instructed first how to pass the urine and then how to use the syringe and how to retain the fluid. The length of time that he should retain it depends on the length of time that there is burning after the injection has been evacuated. If the burning lasts a considerable time, the injection should be retained a shorter time. Unless there is a contraindication of much pain and burning, the retention of the silver solution for five minutes, and perhaps longer, is certainly more likely to allow the germicide to penetrate more deeply.

The injection may be used every three hours for the first twenty-four hours, and every four hours thereafter. Every fourth day at least a smear of the discharge should be examined for the presence of gono-

cocci. As they diminish in number the strength of the fluid is reduced and the frequency of its injection is diminished from four times daily to only twice daily.

After the organisms have disappeared from the discharge for from three to seven days the injection is reduced to once a day, and from five to ten days later it is discontinued altogether.

This frequent injection of the urethra would seem a little strenuous for the patient, and might need to be modified if it had caused much swelling and inflammation. As mentioned under the section on physical therapy, hydrotherapy in the form of hot applications and hot sitz baths may give relief if much inflammation or irritation is present.

#### IRRIGATIONS

This method of treatment is more common on the continent than in this country. The number of drugs used for this purpose also embraces almost every drug of antiseptic nature in the pharmacopeia and elsewhere. According to Luys the chief and only contraindication is an acute local painful condition. Among the drugs used the principal ones are the silver salts, mercurial salts, potassium permanganate and bismuth salts. Very dilute solutions should be used at the start. The water should be warm, sterile water. The technic of giving such irrigations is difficult, though simple, and should be thoroughly understood before it is attempted. The solution is placed in an irrigation douche vessel which is fixed at a height of from three to five feet above the patient. The cannula is attached to a long tube leading from this vessel and there should be a stopcock to control the flow. The patient urinates, and lies prone. The genitalia are cleaned with an antiseptic solution and a basin is placed to catch overflow. The glans is held with the left hand and the meatus held apart. The cannula is introduced. At first the anterior urethra is irrigated. The cannula being withdrawn and the fluid allowed to run out. The cannula is again introduced, the meatus closed against it and the patient instructed to bear down as though to urinate. The fluid then enters the bladder and posterior

urethra. It is sometimes necessary to anesthetize the urethra by the injection of ten c.c. of a weak local anesthetic, such as 1 per cent. stovain.

The irrigations should be employed at least once daily and should be continued as long as a discharge is present. This may be as much as two weeks; they should then be gradually discontinued, giving irrigation every other day, twice weekly, and finally once each week.

Potassium permanganate is used in strength of 1:8,000. Albargin is used in strength of 1:1,000. Protargol is used in from 1:1,000 to 1:2,000 strength, and argyrol from 1:500 to 1:250.

#### ASTRINGENTS

As soon as the gonococci have disappeared and been absent for several days a continued catarrh of the anterior urethra is best treated by astringents, and there is probably none better than the generally used zinc sulphate. At first injections may be given twice daily, rarely three times daily, and then gradually reduce the frequency. While zinc sulphate is often combined with several other ingredients for injection, it probably acts as well in simple solution, as follows:

	Gm. or C.c.	
R Zinci sulphatis .....	50	or gr. viii
Aquae .....	100	℥ iv
M. Sig.: Use externally as directed.		

Pusey has suggested also the following:

	Gm. or C.c.	
R Zinc sulphate .....	60	gr. xii
Resorcin .....	1 25	or gr. xxiv
Water .....	100 00	℥ iv
R Zinc sulphate .....	60	gr. xii
Phenol .....	20	or gr. iv
Water .....	100 00	℥ iv
R Zinc sulphate .....	40	gr. viii
Lead acetate .....	80	or gr. xv
Water .....	100 00	℥ iv

This subacute stage of gonorrhea should cease in about two weeks, and if it persists longer it seems probable that there is some complication of a previous



inflammation or a localization that should be definitely treated. If at any time during this subacute stage the secretion shows gonococci, the silver albuminoid injection may be used. During this stage the same restricted diet should be continued, but more exercise may be allowed.

If posterior or anterior urethritis persists with gonococci absent after the period of subacute inflammation has passed, the use of silver nitrate solutions has been advised. The whole length of the anterior urethra may be treated through an endoscope by means of a cotton swab medicated with 0.5 or 1 per cent. nitrate of silver solution or there may be instilled by means of a deep urethral syringe a syringeful of a 1: 5,000 to 1: 250 solution of nitrate of silver, or a few drops of a 0.25 to 0.5 per cent. solution. Such treatment should not be repeated oftener than once in five days. The passing of all instruments through the urethra, even in this late stage of gonorrhea, should be done with the greatest care, and thin, bland oils are the best lubricants.

#### MERCUROCHROME-220

Impressed with the possibilities of using dyes as a basis for the development of therapeutic compounds, Young, White and Schwartz (*Jour. A. M. A.* 73: 1483 1919) concentrated efforts on the production of new drugs possessing the penetrating qualities of dyes while at the same time being germicidal and relatively non-toxic and nonirritating. Mercurochrome-220 they found could be shown to have germicidal value. The speed with which some old infections of the bladder and kidney pelvis disappeared after its use was striking, and the absence of irritating and toxic qualities, together with the ability of the patient to retain a 1 per cent. solution for hours without discomfort, sufficiently proved to establish the possibilities of the drug in these conditions.

Its value in colon and staphylococcus infections led them to apply mercurochrome-220 to gonorrhea and chancroidal ulcerations. Solutions of this drug in strength from 0.1 to 5 per cent. have been used in the

human genito-urinary tract as a local antiseptic. In the kidney pelvis a 1 per cent. solution was used. This was slowly injected through the ureteral catheter, the catheter was plugged, and the solution was retained for five minutes. There was no sign of irritation or reaction following its use. This procedure was carried out three times in one week in some instances. In the urethra a 5 per cent. solution caused only temporary burning when retained five minutes, and a number of cases of acute urethritis were treated by the use of 1 per cent. solution injected four times a day, the solution being retained five minutes at each injection. There was no irritation beyond occasional temporary smarting. No cases of retention were seen, and no stricture formation resulted from its use in a series of cases.

In treating acute anterior gonorrhea a 2.5 per cent. solution of mercurochrome instead of 1 per cent. has been later recommended. This may be used every three hours, and should be preceded by a cleansing irrigation of sterile water. It causes a little more burning than the 1 per cent. solution, which, however, is temporary. On incomplete data, it seems that the time necessary to render the urethra organism free is definitely shortened by the use of this stronger solution. No unfavorable complications have been observed. Cases were also treated by the use of 5 per cent. mercurochrome in lanolin, and petrolatum equal parts.

#### COMPLICATIONS

If the morning drop persists follicular urethritis is probably present, irrigations are advisable, as if solutions pass from the anterior urethra back into the bladder they cleanse the mouths of the follicles which are directed forward, and the retained secretions are thus removed. For this purpose a solution of 1:30,000 of bichlorid of mercury or a saturated solution of boric acid, or a 1:2,000 potassium permanganate solution may be used. The solution selected should be given by the ordinary irrigation apparatus, viz., a short glass urethral tube and the pressure necessary to cause the solutions to flow gently into the bladder.

If there is great disturbance from the posterior urethritis, the patient should be put to bed. The anterior urethra may be washed with boric acid solution and then the mucous membrane anesthetized with a 2 per cent. solution of eucain or 1 per cent. stovain, and a soft rubber catheter, 14 to 16 French, passed into the deep urethra. Then instill into the deep urethra 2 or 3 fluidrams (from 10 to 15 c.c.) of a silver albuminoid solution, or a solution of nitrate of silver in strength of 1:5,000 to 1:1,000. Such instillation may greatly relieve the patient of his distressing symptoms. This treatment may be repeated in a day or two, if it proves to be necessary.

It should not be forgotten that these apparently severe symptoms of a posterior urethritis may really be a prostatitis, or even the beginning of a prostatic abscess.

A posterior urethritis pure and simple in the acute stage of gonorrheal arthritis will rarely need irrigation treatment. As a general rule, it will be found that hot baths, absolute rest, a milk diet and the administration of alkalies will within twenty-four hours stop the intensity of the symptoms.

#### VACCINE AND SERUM THERAPY

Vaccines, serums, sensitized vaccines and autogenous serums have been used in gonorrhea and its complications, with startling reports of success or of complete failure. These methods seem particularly adapted to the treatment of the complications.

#### PROSTATITIS AND SEMINAL VESICULITIS

The most frequent, and the only frequent cause of inflammation of the prostate and of the seminal vesicles is gonorrhea. Without regard to the importance of acute inflammation of these parts the chronic and persistent harboring of the gonococcus by these organs, making the carrier of these germs a menace to himself and others, makes the subject of vast importance. It is hardly necessary to state that most gynecologic inflammations are due to the gonococcus, and most frequently the infection is received innocently and is

due to a latent gonorrhea, or a chronic prostatitis or vesiculitis due to an uncured gonorrhea in the male. Chronic gonorrheal infection of the prostate and seminal vesicles is of comparatively frequent occurrence. The symptomatic evidences may be slight. There often is an increased frequency of urination; there may be a feeling of fulness or uncomfortableness in the perineal region; there may be a slight sticky or mucopurulent exudate and the urethral drop, and the urine may be cloudy. On the other hand, the urine is not always cloudy with this subacute or chronic prostatitis.

While it is probably rare to find gonococci in prostatic exudate a year after the original infection, it does occur, and before a year the gonococci may be frequently found when there are no apparent evidences of the previous gonorrheal infection. When following massage of the prostate and stripping of the seminal vesicles the examination of the slide from the drops of secretion exuded from the urethra show gonococci, of course the diagnosis is positive. If such an examination shows no gonococci in a suspected individual, it has been suggested that from 1 to 2 c.c. (5 to 10 minims) of a 1 per cent. solution of nitrate of silver be injected into the posterior urethra with the Ultzman syringe. The stimulation from this injection will cause, the next day, an increased discharge, which should cause gonococci to be found on microscopical examination, if they are still present.

Besides the local symptoms described of chronic prostatitis, patients who are suffering from this condition often have symptoms of neurasthenia and hypochondriasis. Men otherwise well, with no apparent cause for symptoms of nerve tire, should be carefully questioned as to previous gonorrheal infection, and the prostate and any secretion that can be expressed from it should be carefully examined, even if the local symptoms are negative.

Acute gonorrheal inflammation of the posterior urethra is, of course, readily diagnosed by the cloudiness of the urine. A later involvement of the prostate or seminal vesicles is diagnosed by the finger passed well up the rectum and noting the enlargement



and tenderness of the prostate, and, if the seminal vesicles are involved, by noting their fulness and tenderness. Normal seminal vesicles are hardly palpable.

Acute inflammation of the prostate and vesicles should be treated with rest, a diet of milk and simple cereals, plenty of water should be taken, and hot sitz baths once or twice a day. The urine should at first be rendered alkaline with potassium citrate during the acute irritation, and later hexamethylenamin or salol (phenyl salicylate) should be administered. There should generally be no urethral injections and no manipulation of the prostate, and certainly no passing of instruments into the urethra. If the prostatitis becomes localized and causes an abscess, of course the treatment is surgical interference.

In subacute prostatitis the prostate should be gently massaged, and some of the exuded fluid which is received on a glass slide should be examined under the microscope for pus and gonococci. Generally, there will also be found living spermatozoa and often dead spermatozoa, with prostate epithelial cells, and perhaps crystals of spermin. The tenderness of the prostate determines the frequency and the amount of massage that it should receive; perhaps every second day for a short time, and then twice a week. At each massage the seminal vesicles should be thoroughly stripped. During this subacute inflammation all violent exercise must be prohibited; alcohol should certainly not be allowed, and the patient is usually better without tobacco than with it. Tea and coffee, if allowed at all, should be in small amount. Constipation should be guarded against, particularly in prostatitis. It is always best to wear a suspensory bandage during acute gonorrhea, and during acute and subacute inflammation of the prostate.

The prognosis is good if the patient will give himself the proper rest in the acute condition, if he will take care of himself in the subacute condition, and will persist long enough in his treatment of the chronic condition.

If gonococci are present in this secretion in subacute or chronic inflammation, vesical injections of weak silver solutions, such as from 1:500 to 1:1,000 of one of the silver albuminate preparations, should be

given daily or every other day, and at least every other day or generally every day the prostate should be massaged while the solution is in the bladder. The patient then urinates and thus washes out the bladder. These bladder washings should gradually be less frequently repeated, and as soon as the gonococci are found absent from the prostatic secretion, the bladder injections are given only infrequently. A microscopic test should be made once a week for three or four times, and then again in a month. The gonococci remaining absent, the patient may be considered cured of the infection. The old assertion that when the gonococci had infected the prostate and vesicles the patient could never be cured, but harbored them for the rest of his life, is probably not now true if the affected individual will allow himself to be properly treated before the germs have found a more permanent harbor deep within the glandular tissue.

In chronic prostatitis without gonococci, or after the gonococci have disappeared, besides massage of the prostate once or twice a week, local applications can be made by high injection of from 1 or 2 c.c. (5 or 10 minims) of various silver solutions, the strength of which should vary from 1 to 3 per cent. Instillations should not be used more frequently than once in five days. Not infrequently the double closed catheter, which allows the circulation of cold water, is one of the best tonic treatments of the posterior urethra and prostate. Such treatment is indicated only in the chronic form of the inflammation when the prostate has not returned to its normal size, normal tone and normal feel.

In chronic gonorrheal infections particularly the vaccine and serum preparations seem to offer most hope of success. They may certainly be given a trial.

Smith, Lusk and many foreign observers have reported very successful results in chronic gonorrheal complications from injections of foreign proteins, producing a marked reaction with high temperature followed by a disappearance of the gonococci from the tissues and exudate obtained on stripping. The sensitivity of the gonococcus to high temperatures is a good theoretical basis for the use of such treatment,

and in very obstinate cases where there are no complications this treatment might be tried as a final resort. The method is described in the discussions of chronic arthritis and of psoriasis.

### CHANCROID

Chancroid is a condition occurring only among those who are careless and dirty, as evidenced by the fact that it is easily prevented by prophylactic treatment consisting simply of thorough washing with soap and water. The great danger of chancroid is that it is sometimes mistaken for syphilis or that syphilis is overlooked and the condition diagnosed as chancroid. Regardless of the appearance, duration or previous treatment of a venereal sore it should always be examined for the presence of the *spirocheta pallida*.

Wassermann tests should also be made on these patients in every case.

The patient should be put to bed, kept clean and given a nourishing diet. In many cases abortive treatment is advisable. The chancroid may be thoroughly eradicated with the actual cautery, the patient being given a general anesthesia preferably of nitrous oxid oxygen. Chemical cauterization is also used. Robbins and Seabury have suggested local anesthesia and then the application of a 25 per cent. solution of copper sulphate in distilled water accompanied by the short high frequency spark from a rather fine pointed vacuum electrode for from one to three minutes. The current is not turned off until every crack and crevice has been thoroughly treated and the surface of the sore is changed to a dark greenish gray. It is then wiped dry and some antiseptic powder is applied.

This treatment is not applied where the healing process would yield distressing deformity, where there is intense inflammatory reaction or much edema, where there is inguinal adenitis or bubo, or when the condition is healing spontaneously. In such cases reliance is placed on ordinary antiseptic treatment to promote healing. Such solutions as warm saturated boric acid, mercuric chlorid, 1:10,000, or potassium permanga-

nate, 1 : 3,000, may be used. In very acute cases, Pusey suggests the application of liquor alumini subaceticis, one part to fifteen parts of water. If wet dressings are impracticable, antiseptic powders and protection may be used.

If the chancroid is complicated by phimosis subpreputial irrigations with mild antiseptic solutions should be used and if this does not check the condition the prepuce may be freely incised down the dorsum. The sores being exposed are then easily treated and after the inflammation has wholly subsided circumcision may be done. It should not be done in the presence of active inflammation.

### CHRONIC HYPERTROPHY OF THE PROSTATE

This condition should be distinguished from enlargement of the prostate due to a subacute prostatitis, which is an inflammation that affects the ducts and is generally due to an infection that has come from the urethra. Although this enlargement of the prostate may persist for some time, proper local applications and massage will generally effect a complete cure.

True chronic hypertrophy of the prostate develops insidiously and is of frequent occurrence as it is present, in various grades, in about 65 per cent. of all men after the age of 50. The treatment of this condition is well discussed under three heads: prophylactic, palliative, and operative.

#### PROPHYLAXIS

As the etiology of chronic hypertrophy is not clearly understood, it is difficult to lay down a definite rule for prophylaxis. While it is probable that this is a normal accompaniment of old age, the reason that it occurs so frequently at an earlier age, from 50 to 60, may be because of excessive or abnormal sexual activity. Investigations seem to show that benign hypertrophy occurs very much more frequently in the married man than in the single man.

There seems to be no question that frequent, and especially abnormal sexual excitement does congest the prostate, and repeated prostatic congestions lead to a



slow hypertrophy. It is also probable that a bad heart which allows venous congestions, especially when the veins of the pelvis (and the hemorrhoidal veins especially) are dilated, would become an impetus to passive congestion and later to hypertrophy of the prostate. Persistent constipation would be another added cause of this passive congestion. Bladder irritation and irritability, if frequently repeated and never completely cured, could be a cause; while varicocele could be another cause for prostatic congestion. In other words, anything that tends to repeated pelvic acute congestion or chronic pelvic passive congestion may well be an exciting cause to the enlargement of the prostate, which organ is always apparently ready to enlarge after the age of 50. Consequently, any treatment that removes or prevents these congestions would be prophylactic treatment against hypertrophy of this gland.

#### EARLY SYMPTOMS

The early symptoms of an enlarging prostate are increasing frequency of urination, especially at night; slight delay in starting urination, especially early in the morning or when the bladder is full; and a slight diminution in the expulsive force of the stream. These symptoms have usually been present many weeks, and even months, before the physician is consulted. By this time the hypertrophy has advanced to a considerable degree, and enlargement of the prostate, as shown by examination, is generally positive. The question immediately arises as to whether palliative treatment should be advised or an immediate operation performed.

It would seem unwise, even with the very low mortality when the operation is done at this period, from the fact that there is a mortality, to urge immediate operation. Neither the condition itself nor the operation is really the cause of the mortality, but it is due to the concomitant or coincident insufficiency of the kidneys, possibly to an arteriosclerosis. It should be remembered that when a man is suffering from chronic hypertrophy of the prostate he also has probably used his circulatory system to excess, the arterial tension

is generally high, the heart may be in perfect condition but undoubtedly the left ventricle has become hypertrophied to combat normally increased tension of the man's life and the increased tension of the arterial system due to advancing years. Also, although the urine apparently may be perfectly normal, the kidneys are often imperfect at this age, as would be evidenced by repeated examinations of the twenty-four hours' urine on different diets and under different irritations or exertions. In other words, kidneys that are perfect during the ordinary daily life, when the patient is subjected to anesthesia or to the slight shock or disturbance of an operation, become insufficient, and uremic symptoms readily develop. Therefore, the treatment of the above condition should at first be palliative.

The great source of danger is residual urine, *i. e.*, the urine which remains in the bladder after the patient has urinated and which he cannot evacuate by voluntary effort. That there is a residual urine can be determined only by the passage of a catheter. A soft rubber catheter, properly sterilized, can generally be passed without difficulty, this after the patient has urinated, and after the parts are thoroughly cleansed and rendered aseptic. A study of the urine that the patient passed (and best a study of it in the two-glass test), and a study of the urine which may be drawn by catheterization, *i. e.*, the residual urine, will not only determine the character of the urine, but also the condition in the bladder. An acid urine, clear, without pus, without much mucus, without blood caused by the catheter rubbing over the prostatic urethra, shows that temporizing and palliative treatment should be the treatment elected. The evacuation of clear urine by the patient does not positively preclude the possibility of even a large amount of residual urine, as absolutely clear urine may be passed on repeated days and yet catheterization remove a large quantity of turbid residual urine. If there is no residual urine, good, sensible tonic treatment, a proper amount of rest, a properly regulated diet, good management of the bowels, prevention of chilling, and the happy medium of never attempting to hold the urine too long or on the other hand answering every frequent flitting desire to urinate, may hold the patient in the same condition for

months or even years. It is undesirable to allow the patient to urinate too frequently, because it prevents the bladder from becoming normally distended, and the viscus becomes smaller and smaller until life becomes a misery.

If there is much mucus from the bladder, or if there is prostatic irritation sufficient to give local aching or a pain in the penis, the first treatment should be to draw the residual urine, then gently wash the bladder with a warm 2 or 3 per cent. boric acid solution. When the bladder washings are clean, the bladder should once more be filled with the warm solution and then the catheter removed and the patient allowed to pass the liquid. Care should be taken not to over-distend the bladder with these solutions. This washing may be done every day for a few times and then infrequently, or absolutely stopped if the symptoms subside.

If there is but little mucus in the urine, and vesical irritability, especially at the neck of the bladder or perhaps slight referred pain at the penis, the instillation into the bladder of 1 c.c. (15 minims) of a 1 per cent. solution of nitrate of silver, once in five days for a few times, or injection into the bladder of 60 c.c. (2 ounces) of a 1:5,000 solution of nitrate of silver and then withdrawing the catheter and allowing the patient to pass the solution, will frequently effect a temporary cure, and may give the patient relief for months.

If pus is present in the urine and the condition is acute cystitis, the usual treatment of this condition must be given, viz., daily bladder washings with warm boric acid solution. If a chronic cystitis has already developed, the bladder washing must be with some of the various silver solutions, either an organic silver solution or a very weak nitrate of silver solution. The silver solution must not be used too frequently. One would hardly advise an operation during an acute cystitis, and would not urge it in chronic cystitis until the bladder was as surgically clean as possible; in other words, after prolonged, proper treatment, with the patient at rest. It is unnecessary to state that an operation, when chronic cystitis is present, *i. e.*, when an infection is present, is of serious prognosis. It is impossible to tell how much the ureters may have

become infected or whether the kidneys have been injured from the infection in the bladder, to say nothing of their secretory ability.

Whenever there is cystic irritability or genito-urinary inflammation the diet should be just as carefully regulated as is so well understood in specific urethritis, viz., in acute cystitis or in acute irritability of the bladder a milk and cereal diet should be given with rest and hot general baths. In chronic inflammation of the bladder or of the prostatic region daily hot sitz baths are of great benefit, and the diet should consist of simple meats, ordinary vegetables, cereals, and fruit. Highly spiced foods, coffee and tea, and generally tobacco, should be forbidden; alcohol should be interdicted, and no drugs should be given that could irritate the genito-urinary tract. The bowels should be carefully regulated. Constipation does harm in all pelvic inflammations.

Acute irritability of the bladder may be partially relieved by the judicious use of drugs that render the urine alkaline, but when there is an enlarged prostate and any tendency whatever to residual urine, the urine should not be rendered long alkaline. The simplest prescription for this purpose is:

	Gm. or C.c.	
R Potassii citratis .....	40	or ʒ ii
Aquae gaultheriae .....	200	flʒ viii

\*M. Sig.: Two teaspoonfuls, in water, three times a day, after meals.

It is often inadvisable to have the patient drink a great deal of water, as it will overfill the bloodvessels (the age of the patient must not be forgotten), raise the arterial tension, increase the frequency of urination, and may precipitate the occurrence of residual urine.

If there is chronic cystitis, no drug (provided the urine is rendered acid) is probably more valuable than hexamethylenamin, which may be given as follows:

	Gm. or C.c.	
R Hexamethylenaminae .....	10	or ʒ iiss

Fac chartulas, 20.

Sig.: A powder in half a glass of water, three times a day, between meals.



## CATHETERIZATION

If there is residual urine and this (which may vary in amount from day to day) persists it is only a question of time when the patient will have a sudden stoppage and be unable to empty the bladder and must send for a surgeon for immediate catheterization on account of distention of the bladder with resulting paralysis. This having once occurred, some surgeons advise the use of a catheter continuously. It is possible in such an instance that if a proper attendant with the most careful cleanliness uses the catheter at least three times in twenty-four hours, and perhaps better four times, in a few days the bladder may return to its proper tone and may be as good or better than it has been before for a number of months, *i. e.*, may not contain so much residual urine. This should be tried. If, on the other hand, the bladder does retain residual urine, and the urine tends to be alkaline and turbid, the man must be given a catheter to use himself, either once in twenty-four hours to remove all residual urine, or three times in twenty-four hours if he cannot at any time well evacuate his bladder. This kind of treatment is sometimes necessary on account of the inadvisability of operating, but is generally inexcusable, as it is only a question of time when such a bladder will become seriously infected and chronic cystitis, incurable, will be the result, and cause the death of the patient. Therefore, unless there is some positive reason why a man can not be operated on, operation should be advised, and advised before infection has occurred.

Some patients develop a chill after the passage of even a soft rubber catheter, or even have what has been called urethral fever, with considerable rise of temperature for some hours. This is not of frequent occurrence, and may never be seen by an individual practitioner. Other surgeons have seen it so frequently that they recommend the administration of some drug to prevent this hyperirritability of the urethra, such as bromids, and even quinin has been recommended. If such a reaction occurs, the patient should be kept in bed for twenty-four or thirty-six hours and treated symptomatically. No harm seems to come

from the disturbance. This fever is probably an anaphylaxis due to erosion of the urethra and absorption of bacterial or protein poison.

Simple palliative treatment of the condition being unsatisfactory, reflex pain in the penis or irritability of the bladder, persisting, cystoscopy should be carefully done, and the possibility of a stone in the bladder should be considered. It must, however, be urged that a mild subacute condition is often precipitated into an acute one by such instrumentation. However, it is a means to an end, *i. e.*, positive diagnosis of the condition, and must often be done, but not done without due and careful consideration. To save repeated instrumentation, at the same time the bladder is cystoscoped, it is well to pass a catheter into each ureter to examine the urine from each kidney separately. The results of this examination will aid in the decision as to whether or not an operation should be performed. The value of roentgen ray pictures should also not be forgotten. Various functional tests, phenolsulphonephthalein, phloridzin, urea, etc., show whether the kidneys are at fault or whether the trouble is chiefly prostatic.

#### OPERATION

It is the object of the careful physician and surgeon to aim to determine when palliative treatment is useless or in any given patient is becoming useless, to advise operation if the kidneys and circulation are in good condition before the patient becomes miserable, before the bladder has become infected, before the bladder has become seriously thickened, and before it has become paralyzed from over-distention or has become badly contracted from protracted and frequent efforts to expel urine over the obstacle of the enlarged prostate. As before stated, infection of the bladder may creep up toward the kidneys, and with infection of the bladder, and even without it, continued pain and irritation in this region may cause a general debility, loss of appetite, emaciation and feebleness. Of course, any of these conditions being present when the patient first comes to the physician would demand, first, rest, careful preparation of the bladder and the pushing of

nutrition, and second, operation; but the patient having been under a physician's care the operation should be advised and done before he reaches this sad condition.

Which particular operation is best for a given individual, or the technic of the operation are questions of surgery; it is enough for the physician to decide that an operation is necessary. The results of prostatectomy are surprisingly good when one takes into account the advanced age of many who submit to the operation, the frequent coincident cystitis, the history of prolonged pain and often debility of the patients, and the impairment of circulatory and excretory organs concomitant to their age. Many patients over 80 years of age are operated on with good results and their lives greatly prolonged by the operation, and the mortality has been placed even below 4 per cent.

The differential diagnosis between tumors of the prostate and simple hypertrophy of the prostate can not well be described. The greater amount of pain in most tumors of this age (the most frequent being cancer), with the greater rapidity of growth, with the nodular feel and enlargement in all directions as well as into the bladder, generally quickly shows that the enlargement is malignant and not benign.

# OBSTETRICS AND GYNECOLOGY

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## TOXEMIAS OF PREGNANCY

The disturbances which occur during pregnancy and some of the severe conditions at parturition are due to varying causes. The treatment that is efficient and satisfactory in one instance may not be efficient in another. The view has been advanced that the condition is essentially anaphylactic in character. Intestinal indigestion, disturbances of the parathyroids and thyroid; disturbances in the fetal organism, in the placenta, in the kidneys and in the liver may be a cause.

Since it is positively demonstrable that serious toxemias may be caused by prolonged constipation, it is certainly logical to presume that constipation even in a mild form is provocative of the absorption of toxins that should have been eliminated by the intestines. These toxins seriously impair the perfect activity of the liver, to which they first go through the portal circulation. If the liver is so continuously irritated, it can not well do its normal work. Toxins or irritants to metabolism soon get through this filter into the systemic blood and cause nervous, circulatory and kidney irritations. Such irritations at first, and perhaps continuously, may be inconsequential, but they may be the forerunners or the instigators of serious conditions in the latter part of the pregnancy. A primary axiom in pregnancy, then, should be that constipation must not be allowed, and such means must be inaugurated and persisted in as will prevent constipation, intestinal stasis, intestinal fermentation, putrefaction and the absorption of toxins. If any one of the digestive organs is not properly functioning it should be assisted, if possible. The diet should be so arranged as not to aggravate this disabled organ, and to relieve it of as much work as possible.

## HYPOTHYROIDISM

It has been demonstrated, apparently, both physiologically and clinically, that the thyroid gland normally hypersecretes during pregnancy. If the thyroid does not secrete properly, various toxemias occur. A mal-



secreting thyroid may be related to pernicious vomiting during pregnancy, can certainly interfere with the nutrition of the fetus, and can interfere with the health of the mother.

If by a careful study of the pregnant patient it is decided that the thyroid gland is not properly secreting, thyroid substance should be administered. The dose during pregnancy should be small. Just preceding parturition, if it is feared that eclampsia may occur, and especially if the kidneys are insufficient, thyroid may be given in larger doses. If a patient gives birth to a child showing imperfect development or symptoms of under-thyroid secretion, although it might not be a cretin, thyroid may be administered to the mother throughout her subsequent pregnancies, unless symptoms forbid its use. A daily dose for a pregnant patient, short on thyroid secretion, should not be more than 0.20 gm. (3 grains) once a day, and generally half that dose is enough, while a patient who shows serious toxemia or critical symptoms of metabolic poisoning should receive 0.30 gm. (5 grains) three or four times a day for a short period. A patient needing thyroid just before or during parturition may be given 0.60 gm. (10 grains) once or twice, while a patient with eclampsia may be given 1.30 gm. (20 grains) at one dose.

#### OTHER CAUSES OF TOXEMIA

Malnutritions of the fetus and degenerations of the placenta may cause the formation and absorption of toxins that poison the mother. The cause being discovered and improvement not soon taking place would seem to call for cleaning out the uterus—this, of course, after a consultation.

An uncomplicated true nephritic toxemia should certainly be discovered. A uremic condition from nephritis of pregnancy must almost always be a progressive condition. Consequently a progressive chronic nephritis can only be overlooked by utterly neglecting to make proper examination of the urine. If a chronic nephritis, by evidences in the urine, shows a progressive inflammation, a final toxemia, due to allowing a pregnancy to continue too long before interference,

should be prevented. Consequently the most serious toxemias and eclampsias are those that do not present kidney symptoms or signs until the last moment, and these toxemias are due primarily to disturbances of other organs than the kidneys, generally perhaps some endocrine disturbance.

If the kidneys were previously healthy, i. e., if an insidious chronic interstitial nephritis was not present, a nephritis due to pregnancy should be quickly recognized by the albumin in the urine. Therefore, an examination for albumin and casts is usually sufficient to show whether the kidneys are in primary trouble or not.

#### TREATMENT

Every effort should be made to relieve the kidneys by getting the skin and bowels to act and by the administration of a carefully modified diet. If there be headache or edema the patient, in addition, should be kept in bed and should have hot baths, free purgation and a milk diet. If the condition becomes more severe, warm saline lavage of the stomach and intestines is useful. In the nephritic cases, if in spite of this method of management the patients get worse, labor should be induced. One of the most important points emphasized is that a pregnant woman's urine must be analyzed once a month during the first six months of gestation, and at least once a fortnight after that period.

#### VOMITING OF PREGNANCY

The cause of severe vomiting of pregnancy has not been determined. The condition most frequently appears between the third and fifth week of pregnancy. Among many causes which have been suggested are reflex influences such as pressure on nerves connected with the uterus, stomach and other abdominal viscera (and of these the most important are those due to displacement of the uterus and its adnexa) neurotic, toxemic and some endocrine gland disturbance.

First, then, a complete history of the patient should be taken, an opinion formed as to her normal mental or nervous temperament, and a thorough and complete

physical examination made. If the condition is due to hysteria, the patient should generally be isolated and moved if possible to a situation where she will have an entire change of surroundings and attendants; the treatment then becomes mostly hygienic and suggestive.

Jung (*Deut. Med. Wchnschr.*, 1916, 42, p. 61) emphasizes the importance of discriminating between the ordinary harmless vomiting of pregnancy and the serious type. The loss in weight is the criterion, but this must be determined with precision, weighing the woman every third day under like conditions and on a good scale. The best time for this is following defecation after breakfast, with the clothing always the same. The amounts eaten must be recorded in writing for each meal, and the vomit must be saved to show the physician. To prevent ordinary vomiting from developing into the severe type, he orders the breakfast to be taken in bed, with an hour's repose afterward. Food should be taken often and never much at a time, preferring fluid food at first but resuming the ordinary food as soon as possible, omitting all dishes which the woman does not like in health, impressing on the patient that if the directions are closely followed there will be no vomiting. The stomach is not responsible in any way for the vomiting, and hence does not require special treatment. In the severe type we must stop all intake of food and fluid. This is difficult and sometimes impossible in the home. If the woman is really losing weight, she should be placed where the starvation treatment can be given a thorough trial before resorting to the evacuation of the uterus. The transference to the hospital in itself has a pronounced effect on the nervous predisposition.

#### UTERINE DISPLACEMENT

If examination reveals a misplaced uterus (and probably a retroversion is that most frequently found), replacement should be made immediately and a properly adjusted pessary placed to maintain the correction until such time as the enlarging uterus will retain its proper position unaided. Occasionally adhesions may be found which prevent the manual correction of the

fault. The condition then becomes more formidable, and recourse must be had to surgery. The same holds good in incarceration, and in this condition not infrequently corrective measures result in abortion. Erosions of the cervix, cicatrices, and polypi may be causes of the nausea and vomiting, and these if found should receive proper attention. However, surgical procedures, unless of a most trivial nature, should be reserved as a last measure, since they are liable to induce abortion, as are also such procedures as may require either a tampon of any considerable size, or packing of the vagina. If the vomiting still persists after all corrective measures possible have been made, it may probably be assumed to be due to intoxication.

#### SUPPORTING NUTRITION

The two great difficulties are the maintenance of the patient's nutrition and the combating of the prostration caused by the vomiting. Under whichever heading we choose to meet the case, hygienic measures stand first and nothing should be omitted which tends to their furtherance. The diet should be of the simplest, and milk should form its bulk. One after another of its simple dishes must be tried, to be discarded if they are not retained. When the patient is first seen, if the stomach is washed out and nothing allowed but water for twenty-four hours, the bowels being thoroughly cleaned out meanwhile, milk will generally be retained. Just before giving the milk a small dose of morphin, 0.005 gm. (1/12 grain) subcutaneously, may cause it to be retained. If it is retained, the drug may be given previous to further administration of food, lessening the dose each time, and, not infrequently, when a placebo is ultimately substituted for them, the food will be retained as well. Sooner or later, unless conquered, even idiopathic cases are found to have their etiology in intoxication and elimination becomes the main point of all treatment.

If the vomiting persists, nothing should be allowed by the mouth for a day, and four nutrient enemata should be given instead. These are disagreeable to the patient and sometimes the vomiting stops abruptly



when she is told that mouth feeding will be resumed when she stops vomiting. Formulas for such nutrient enemas will be found under the article on rectal feeding.

The urine of course should be examined with great frequency and close watch should be kept on the elimination of solids, but an undue anxiety because of their diminution should not be felt when the intake of food or the food retained is small. A due regard to this should be kept in mind.

### HYGIENE

The bowels should be moved freely once a day, with such simple laxatives as are efficient in her case.

Daily warm baths, with massage, plenty of fresh air, the patient kept in bed, the avoidance of the odor of cooking food, and the avoidance of all measures that tend toward excitement are to advantage. Counter irritation by mustard plaster or turpentine stupes placed over the stomach is generally a help and sometimes efficient. Also carbonated or effervescent drinks will often be retained when "still" liquids are vomited.

### MEDICAL TREATMENT

Sodium (or potassium) bromid is often of service in these cases. It is best given in one gram (15 grains) doses, well diluted, by mouth if possible, if not, by rectum, and repeated every two or three hours until the vomiting is conquered or the treatment proves useless.

Although bromids appear to be efficient, thyroid is not infrequently of use. It should be tried in small doses, about 0.20. gm. (3 grains).

Corpus luteum, best given subcutaneously, is at times of value. It is obtained in ampules containing  $\frac{1}{3}$  grain of soluble corpus luteum powder in 16 minims of physiologic saline solution. One dose a day for a few times, then a dose once in five to seven days is often sufficient.

If there is great nervous irritability, often showing parathyroid insufficiency, calcium is valuable.

## DIET

Liquid diets may be advisable, but frequently a patient may retain solid foods and vomit liquids.

## THERAPEUTIC ABORTION

When all measures have failed to control the vomiting and before the patient has actually reached a dangerous condition of prostration, consultation should be had and measures should be taken to empty the uterus. Naturally, of course, one waits as long as possible before doing this. The signs of actual danger are the continual rapid decline in weight, declining blood pressure with increasing pulse rate, appearance of acetone in the urine and a febrile temperature. If these signs occur in spite of proper dietetic measures, abortion will have to be induced. This should not be postponed until the patient is unable to stand the necessary maneuvers. The written consent of the patient and family should be obtained, and it is safer to call in an experienced consultant.

## ECLAMPSIA

There is probably no condition that the medical man has to cope with that makes, from prodrome to sequelae, such demands on his capabilities, his judgment, and his tact as does this toxemia, for intoxication it is, poorly though we may understand it and little as we know of its etiology. Having its cause in some disturbance of the chemistry of either internal secretion or metabolic function, or both, its treatment must necessarily be elimination until an increased knowledge of the condition permits it to be corrective.

The etiology of eclampsia as formulated into a table of relative values by Mosher (*Jour. Missouri State Med. Assn.* 16: 69, 1919) follows:

1. Failure of elimination of toxins. These in the early months are doubtless due to the placenta, and in the second half of pregnancy doubtless to the excretions of the fetus.

2. Infections of various types throw a burden on the pregnant woman.

3. We have an asphyxia of greater or less degree, resulting from pressure and from stasis with a decrease

of normal power of maternal oxygenation, thus interfering with lung expansion and with the action of the heart.

Accepting this theory of the production of eclampsia, a standardized plan of prophylaxis and treatment has been outlined:

1. Diet which shall be of nonirritating food.
2. Elimination encouraged by kidney, bowels, skin. Intake and output of fluids is a most important routine and must be shown in a daily consolidate report.
3. All foci of possible infection, tonsils, teeth, kidneys and bowels, should be discovered and eradicated.
4. Deep breathing, by aids to general circulation and by fresh air, avoids danger of asphyxia.
5. Free exhibition of alkali-salts and food anticipates acidosis.
6. *Veratrum viride* by a system devised to lower blood pressure, reduce the pulse and aid diaphoresis.
7. The emptying of the uterus as a therapeutic measure to be done in the way least conducive to shock is indicated as soon as prophylactic measures fail.

When it is possible to take the patient to a hospital, this should be done at once, for a case of eclampsia can at any moment present conditions which even the resources of a hospital, with its trained attendants, find difficulty in meeting, and these conditions can change with a rapidity which none but institutional resources may attempt to meet. Whatever difference of opinion there may be concerning other features of this condition, there can be no question that more cases are saved under institutional treatment than under any other, and only by reason of their increased facilities. If it be impossible to take the patient to an institution, and home treatment becomes a necessity, then the first thing to do is to prevent self injury to the patient by instructing some one present how to hold a towel, cork, or a rubber eraser between her teeth, and to keep her on the bed.

#### EXAMINATION

A thorough examination should be made, and if there are convulsions present or the examination starts one, sufficient amount of chloroform may be adminis-

tered to allow the examination to be completed, and that thoroughly, for it is more important to know the exact condition present than to start any treatment with an incomplete knowledge of the case.

The examination having been completed, if delivery is indicated the cervix can usually be completely dilated under chloroform without instrumentation (*i. e.*, with the hand), forceps applied, and delivery completed. The placenta should generally then be removed, not waiting the usual twenty minutes, and the method of Cr  d   is preferable.

Generally there is a tendency to profuse hemorrhage, and, the placenta having been removed, the uterus should be thoroughly irrigated with hot physiologic saline solution and it and the vagina packed with sterile gauze. However, the packing being in readiness, it is good judgment to wait a few moments before using it, to see if the hot irrigating solution provokes sufficient contraction to stop the bleeding, for if it does, there is avoided the presence of an unnecessary foreign body in the uterus.

Laceration, if present, should generally be repaired at once, always if it has caused hemorrhage. If not, the patient's condition may occasionally make the postponement of the repair advisable.

#### ELIMINATIVE TREATMENT

If indications for immediate delivery are not found, *i. e.*, if the cervix is not much shortened or not much softened, the os undilated, and few or no uterine contractions (and this last is the most important determining factor, since uterine contractions appear to excite the eclamptic convulsions) eliminative treatment should be started. If there is stertorous breathing, with small pupils, and slow, full, high tension pulse, and if the patient be more or less comatose, "bleeding" is indicated, and from 150 to 500 c.c. of blood should be removed, but whether or not this should be replaced with physiologic saline solution only the condition of the patient at the time can determine, certainly not if there is any edema. If it seems desirable, the quantity of saline introduced should not be



less than three or four times that of the blood withdrawn. Next flush out the colon with saline solution and allow 1,000 c.c. or more to remain for absorption; provided, of course, that there is no edema. Particularly should the lungs be carefully examined with this in mind. Next, wash out the stomach if possible, and if done at all do it thoroughly, leaving in it 0.40 gm. (6 grains) of calomel, with a little sodium bicarbonate and 10 grains of thyroid. A hot pack may be applied to the lumbar region. If there is vomiting the stomach may again be washed out, leaving in it another dose of thyroid, and a smaller dose of calomel should there be reason to believe that the first dose was vomited. This eliminative treatment must be repeated at intervals until the uterus can be emptied. If it seems inadvisable to wash out the stomach calomel may be given by mouth in the dose above referred to.

#### COMPLICATIONS

Bladder distention is common and must be borne in mind, catheterization frequently being necessary every six or eight hours for several days after delivery.

After delivery, if a sedative is needed, there is none better than a combination of sodium bromid, 2 gm. (30 grains), and chloral hydrate, 0.50 gm. ( $7\frac{1}{2}$  grains), well diluted and given by rectum. This may be repeated in an hour if necessary, but a single dose is generally sufficient. Morphin, too, is frequently advised and given, but in such a condition as this it would seem contraindicated in practically every instance. There is no pain to combat, and usually the patient will sleep from mere exhaustion if her "nervousness" is controlled.

When delivery is completed the danger is by no means over, and a careful watch of the patient is necessary, for it must be remembered that the sequelae of this condition are numerous and a patient can not be called out of danger until at least ten or twelve days have passed.

Should the child survive, it is in all probability also toxic. It should be given water freely, and also, perhaps, colon irrigation once or twice daily. Prognosis as to its survival should be absolutely declined.

## PUERPERAL INFECTION

Though septic infection after parturition occurs much less often than even a few years ago, it is still sufficiently frequent to necessitate resort to every possible method of prevention and to the thorough consideration of effective but non-meddlesome treatment.

This infection occurs most frequently in one of two general forms. One is a typical blood poisoning or sapremia, which is caused by the absorption of toxins or decomposition products of substances that are undergoing putrefactive or other chemical changes in the genital tract. Of course the most frequent substances causing such poisoning are retained fragments of the placenta or membranes, or, if there is any obstruction to the exit of the normal lochia, there may be absorption from this. Such poisoning may be termed an auto-intoxication or autotoxemia. This poisoning may cause more or less rise of temperature, but it may not be high, and although an increased temperature in the first few days after parturition may be due to a bowel infection, to the absorption of bowel toxins, to some disturbance of the mammary glands, to some bladder or kidney disturbance or, of course, to some acute infection to which the patient may have been exposed, still, generally, the cause of such fever will be found to be in the genito-urinary tract. Slight injuries of the uterus, vagina or perineum during parturition may allow absorption of and poisoning by discharges that would otherwise be innocuous.

The other more serious cause of puerperal infection or puerperal fever is the absorption and circulation of pathogenic bacteria. Of these may be mentioned some varieties of streptococcus, pneumococcus, staphylococcus, gonococcus, and perhaps not infrequently the colon bacillus. Localized infections and more or less general disturbance from the last three of these pathogenic germs may not be serious infections as far as the immediate consequences are concerned, and perhaps could hardly be called septic fever. Infections, however, from some form of streptococcus and occasionally from the pneumococcus are always serious; the patient is septic and is suffering from dangerous septicemia. A puer-

peral streptococcic infection quite commonly, though not always, will show a bacteremia and may have as a complication endocarditis, even the malignant type, with perhaps associated local lesions such as pneumonias, pleurisy and kidney infection, a pyelitis or a localized septic process in the kidney substance. Such a general infection is usually associated with more or less pelvic inflammation and pelvic tenderness, but is commonly without any pelvic abscess or purulent discharge.

The prevention of infection before, during and subsequent to parturition, proper cleanliness and care of the patient without meddlesome and obstructive treatment or methods of treatment, and without removing Nature's own protective secretions, are the objects at which to aim.

#### PREVENTION OF INFECTION

Most of the preventive measures are too well understood to require more than enumeration, except that the part that infected teeth and diseased tonsils play in puerperal septicemia is not recognized. Such conditions are a menace, and they should be corrected during the pregnancy. The selection and preparation of the delivery room, the preparation of the patient and of himself are well understood duties of the attending physician. The nurse also well understands the preparation of herself. A few details, however, should be emphasized. The nose of the patient should be gently sprayed and cleansed with an alkaline or mild antiseptic solution. The mouth and throat should be washed with some mild antiseptic mouth-wash, and the teeth thoroughly cleansed. The nurse should not give the patient a vaginal douche unless ordered to do so by the physician. The nurse should be free from any purulent discharge, especially from the nose, throat or even ears. She cannot be too careful in observing the greatest possible cleanliness in the care of the vulva and the vaginal discharges, with the use of such antiseptic solutions and gauze as the physician directs. If the patient must be catheterized, too great care cannot be taken to prevent infection of the bladder.

Although a physician may take every means possible for personal disinfection and wear a sterilized gown and rubber gloves, it seems, except in isolated instances, unjustifiable for him to accept a case of obstetrics while he is in charge of a patient who has a contagious disease, or immediately subsequent to handling such a case, whether it be scarlet fever, erysipelas, measles or diphtheria.

The patient ordinarily should not be given a vaginal douche just before parturition. Very frequently one vaginal examination by the physician, to determine the exact position of the child and the condition of the os uteri, is all that is needed. This examination should be made after sterilization of the hands and with the use of rubber gloves.

Vaginal examinations in pregnancy should comprehend the determination of the following facts: (1) The pelvic size, its normality or abnormality; (2) soft parts: their normality or abnormality: (a) the perineum; (b) the vagina; (c) the cervix and os; (d) recognition of tumors in or about the lower segment—placenta praevia, etc.; (e) the rectum; (3) the fetus: presentation and position; the cephalo-pelvic adaptability.

In labor additional data must be determined: (4) *The fetus*; (a) revisional diagnosis of presentation and position, which must be made because many of the deviations from the normal are the products of labor; (b) the station of the presenting part; (c) the fact of compound presentation, as prolapse of the arm, leg or cord; (d) fetal deformities; (5) the effacement of the cervix, and dilation of the os; (6) the status of the membranes.

#### RECTAL EXAMINATIONS

For most purposes rectal examination yields all of the information necessary. In the technic as described by Holmes the woman should be given an enema before examination. Preferably, she should be on a table, or at least she should lie across the bed in the lithotomy position, with the buttocks quite to the edge, so the gluteal groove will not be in a depression of the bedding. A sterile rubber glove should be employed, for even though the finger enters a contaminated cavity it is



not good practice to use a glove which may have infective matter on it. The finger should be anointed with sterile petrolatum or other unguent, and then should be passed through the anus slowly and carefully. At the same time the other fingers should be flexed in order that they may not accidentally enter the vulvar orifice. The various movements of the fingers should be slowly made, that the minimum of discomfort may be caused. Rarely will there be any pain, even if hemorrhoids are present; in fact, the average discomfort is no greater than when a vaginal examination is made. Generally, the rectovaginal septum is so lax that the examining finger may move with great latitude. Very possibly objections to the method may develop. The danger is that the inexperienced may allow the fingers or thumb to slip within the vulva during certain manipulations. This will be entirely obviated by keeping them flexed. The method is contraindicated when the termination of the labor is imminent, for fear, if haste is necessary, the attendant might forget to change the glove. When there is any delay in a normal labor, any apparent malposition, or other complicating disturbance, several vaginal examinations must be made.

If there is any purulent catarrh of the vagina, especially if gonorrhea is present, cleansing and perhaps mildly antiseptic douches should generally be used. On the other hand, with a normal vagina it seems unwise to remove the secretions, which facilitate the expulsion of the child and at the same time protect the mucous membrane.

#### RETAINED PLACENTA

There is a difference of opinion as to the proper management when portions of membrane or of the placenta are found by examination of the expelled after-birth to have been retained. Most obstetricians would leave these retained substances to be loosened and expelled by natural processes, when ordinary gentle manipulation of the uterus does not expel them. Others believe that the sterilized, rubber-gloved hand should gently clean the vagina, and, if necessary, the uterus. The removal of retained portions of the placenta may prevent unpleasant and even dangerous hemorrhage.

The routine administration of fluidextract of ergot three or four times daily for several days after parturition in 1 c.c. (15 minim) doses, is believed by some modern obstetricians to aid and hasten involution of the uterus. If for any reason ergot is not tolerated or is inadvisable, quinin in 0.2 gm. (3 grain) doses twice a day may be of benefit in furthering this object. The use of pituitary extracts is now a recognized clinical procedure in such cases, but they should be given with caution as to dosage. However, theoretically normal cases require no drugs of this type.

#### TREATMENT OF PUERPERAL INFECTION

If some form of puerperal infection has occurred, of course the first decision is as to whether or not it is local or general. In a local or pelvic disturbance, with more or less rise of temperature but without any symptoms of general infection, the treatment should be conservative and more or less symptomatic. The bowels should be carefully attended to, the diet should be simple but sufficient, large amounts of water should be drunk to dilute all the secretions, and Fowler's position should be used more or less continuously to encourage drainage. Again, vaginal douches generally should not be given.

Of course the vaginal discharge, or, better, the uterine secretion directly obtained, should be studied bacteriologically to decide, if possible, what infection is present. Blood cultures are the only means at present of accurate diagnosis of the variety of infection. The result of this examination may suggest the use of an antiserum or a vaccine, if either be deemed advisable. The blood should also be examined for pathogenic bacteria.

#### STREPTOCOCCAL INFECTION

If a parturient patient has a sudden chill more or less severe, with a rapid rise of temperature which persists in some degree and is not intermittent, and a rapid pulse, puerperal infection has probably developed, unless some serious condition like pneumonia is about to occur. Other symptoms of this general streptococcic infection are: a diminished amount of lochial discharge, perhaps even without odor; more or less

tenderness in the pelvic region; a coated and perhaps dry tongue; bad, perhaps septic, breath; scanty urine; severe lumbar pains; tympanites; at times yellowing of the skin; and later, if the infection progresses and becomes serious, possibly delirium. The progress of the fever is that of a typical septicemia. There may be irregular chills, profuse sweatings and more or less leukocytosis. If the lungs, breasts, kidneys and throat have been excluded as the location of the cause of the temperature rise and onset of symptoms, and if the uterus is tender and enlarged, as it generally is, acute puerperal streptococci infection is in evidence.

The insistence here should be on the fact that because there is a septic puerperal infection, it is not forthwith an indication for a uterine curettage, or intra-uterine or vaginal douching or any other severe operation. The general treatment just outlined for a more localized simple puerperal pelvic infection should be carried out, with more or less tepid spongings to control the high temperature. The bowels should be freely moved each day, large amounts of water should be drunk and perspiration should be encouraged, though the body should be kept clean by frequent warm spongings.

The heart may be stimulated by strychnin, not more than 1/30 grain once in six hours, with caffein (perhaps best as coffee) twice in twenty-four hours, if no delirium is present. Camphor is another valuable cardiac and nervous stimulant and 20 or 30 drops of the official spirit of camphor, given properly diluted once in four to six hours, is good treatment in these cases. In emergencies, one, two or three injections of a sterile ampule of camphor solution in oil hypodermically at intervals of an hour will, at times, tide over cardiac depression. Alcohol may or may not be indicated, depending on whether or not the patient can take other nourishment. It should not be used as a stimulant, and the dose should not be large. Whether ergot should be given must be decided in each case. The ergot will improve the tone of the circulation, but may cause the uterus to contract more than is desirable. Digitalis should not be used except, perhaps, early in the disease, as the inflamed or injured myocardium which

results from an infection must not be hurt by the strong contractions which are caused by this drug.

Fowler's position should be maintained to promote drainage, often with the use of uterine retention tubes, and the Murphy drip may be advisable.

#### UTERINE HEMORRHAGE IN PUERPERAL SEPSIS

If more or less serious uterine hemorrhage occurs, or if the discharges from the vagina are exceedingly fetid, showing decomposition products in the uterus, it may be necessary to institute some operative interference. Perhaps the safest procedure is to administer an anesthetic and to explore and clean the uterus with the finger properly protected. Curettage of an infected uterus is serious and may cause serious results, to say nothing of the danger of perforating the softened uterine wall. It may be repeated that, except for serious hemorrhage, it is probably rarely advisable to clean out the uterus during septic infection. Decomposition will generally cause a loosening of foreign and pathologic tissues from the walls of the uterus, and they will generally be passed out through the vagina. Also, it should be remembered that in this septic infection the uterine muscle itself is more or less inflamed and softened, and contains, as well as the surrounding lymphatics, more or less of the infecting germ. Also, when the infection is well in progress the bacteria are probably in the blood. Severe local measures, therefore, do not eradicate the disease and may open up other avenues of absorption. It may even be wise, in the presence of uterine hemorrhage, to pack the vagina first to see if the loosening membrane or piece of placenta will come away without actual uterine interference.

It should be urged that intra-uterine injections and douches are rarely, if ever, indicated, are generally dangerous and may do serious harm. Vaginal douches in septic infection, while not so dangerous, may also cause harm and should generally be omitted. In other words, the pressure in the uterine and vaginal cavity should always be negative to the pressure in the blood vessels and lymph vessels to promote



exudation into the parturient canal rather than absorption from this canal. There is danger, also, in intra-uterine injections of forcing septic matter into the fallopian tubes. If, later, a pelvic mass is found, whether hematoma or abscess, hot vaginal douches may be allowable and of value in promoting absorption or in hastening localization for vaginal incision and evacuation.

If there is more or less peritoneal inflammation and, therefore, pain, morphin is indicated, as a patient should not be allowed to suffer pain, for depression from acute pain may be the last straw to stop an already weakened heart. Local applications to the lower part of the abdomen in the shape of turpentine stupes or alcohol fomentations may sometimes be of value as counterirritants. Warm applications, as flaxseed or poultices, may give some comfort and prevent the necessity of giving much morphin. They often cause a relaxation of the muscular tissues and lessen the irritation and tension. Of course such treatment is purely symptomatic and entirely non-specific. If serious infective localization occurs in the pelvis, more serious operative interference may be necessary.

In recovery from this very dangerous infection the convalescence is long and tedious, and months generally elapse before there is a return to normal health.

## POSTPARTUM HEMORRHAGE

### ETIOLOGY

The causes in general may be summed up as: Those which interfere with uterine contractions or cause relaxation of the uterine muscle; lacerations of the parturient canal; partial or complete retention of the placenta, and diseases of the blood or blood vessels. The management of the condition includes administration of ergot; removal of uterine contents; repairs of lacerations; massage of the uterus; hot intra-uterine douches; packing the uterus; application of hemostatics or administration of systemic vasoconstrictors.

## PROPHYLAXIS

Avoid precipitate labors. Avoid protracted labors. Avoid a surplus of anesthesia in slow labors; chloral (one gram, repeated in an hour if necessary) is preferable. If there is hemophilia, give a calcium preparation for three months prior to delivery. At the onset of labor see that the bladder and rectum are empty, and as soon as the head is born ergot should be given (preferably by the hypodermic syringe), and the uterus massaged to stimulate contractions. Pituitary extract may be given cautiously.

If hemorrhage begins during the period between the birth of the child and the expulsion of the placenta, and without evident relaxation of the uterus, it may be due to a partial separation of the placenta or to the fact that the placenta is separated but still within the uterus.

## TREATMENT

Hemorrhage immediately following the birth of the child may be from the circular artery of the cervix; from a lacerated vagina, or from a lacerated perineum. In such cases, with the use of the speculum and a constant stream of water to wash away the flowing blood, immediate repair of the laceration is usually easy, and correctly placed stitches will stop the hemorrhage.

If the bleeding does not amount to much more than oozing, swabbing with epinephrin solutions may be effective.

The Credé method of expulsion of the placenta will usually stop the flow by removing the obstacle, and will stimulate the uterus to contract. Failing thus to remove the placenta, the necessity of manual removal should be considered.

The placenta having been born, if the hemorrhage continues and the uterus is soft and flabby, contraction of that organ is the end aimed at. This may be secured by continued manual stimulation from without and the use of pituitary extract.

If the hemorrhage still continues, Bryan, Philadelphia, advises the "bimanual manipulation," usually accomplished "by passing two fingers of the right hand high up into the vagina, along the posterior wall, pressing the lower segment and cervix forward toward the

symphysis pubis, at the same time passing the fingers of the left hand deep in between the umbilicus and the uterus so that the hand on the outside, the fundus resting in the palm of his hand, may be pushed downward and forward against the pubes, thus forming a sort of temporary ante flexion."

When these methods fail, the next thing to do is to pack the uterus. The volsella forceps are preferable for this, as there is little danger that the cervix will contract so as not to admit them, and the ordinary uterine dressing forceps are sharp enough at their points to admit an element of danger from the possibility of their being pushed through the fundus. The packing may remain in the uterus for from six to twenty-four hours, and when it is removed another packing should be ready to replace it, if necessary. These packs may be moistened with gelatin or serum, though this is generally not necessary.

After the hemorrhage has ceased the patient requires rest; injection of saline per rectum; perhaps a blood transfusion or transfusion of some of the solutions suggested under the treatment of shock.

### DYSMENORRHEA

The treatment of dysmenorrhea should, of course, vary with the indications as based on the underlying condition. Cases should be analyzed as to the existence of defective development of the genital organs; abnormal ovulation; in some cases the cause must be sought in the glands of internal secretion.

The condition known as vagotony may be at the basis of the menstrual pain, or local or radiating neuralgias may be responsible. In still another class of cases spasmodic contraction is the source of pains; defective development of the uterus may be the basis for this or it may be maintained or aggravated by pain in the ovaries. The spasm may be more painful when there is any mechanical hindrance to distention of the ovaries and uterus during menstrual congestion.

Mosher believes that dysmenorrhea is largely a functional disorder, congestive in type and produced by (1) the upright position; (2) alteration of the normal type of respiration by disuse of the diaphragm

and of the abdominal muscles; (3) the lack of general muscular development; (4) inactivity during the menstrual period; (5) psychic influences. She shows how the upright position with the valveless vena cava causes uterine congestion which tends to become exaggerated when the abdominal muscles are lax, when costal breathing is employed and by clothing which interferes with the action of the respiratory muscles. Mosher has corrected these conditions in many cases by the following method: "All tight clothing having been removed, the woman is placed on her back, on a level surface, in the horizontal position. The knees are flexed and the arms placed at the sides to secure relaxation of the abdominal muscles. One hand is allowed to rest on the abdominal wall without exerting any pressure to serve as an indicator of the amount of movement. The woman is then directed to see how high she can raise the hand by lifting the abdominal wall; then to see how far the hand will be lowered by the voluntary contraction of the abdominal muscles, the importance of this contraction being especially emphasized. This exercise is repeated ten times, night and morning, in a well-ventilated room, preferably while she is still in bed in her night clothing. She is cautioned to avoid jerky movements and to strive for a smooth, rhythmical raising and lowering of the abdominal wall." The results have been that the pain has been lessened in many cases and wholly removed in a large number. The desirability of more activity is noticed but she cautions against excess, especially in the athletics of college training. A hopeful mental condition is important, and it is unfortunate that pain or disability is so commonly expected.

In those types of dysmenorrhea due to vagotony, when the autonomic nervous system is in a state of hypertonicity, the pronounced spasticity from overstimulation of the vagus brings on pain at menstruation and atropin wards this off or cures it. In small doses atropin has a stimulating and in large doses a paralyzing action on the sympathetic nervous system, and instances of failure to relieve the dysmenorrhea are probably due to incorrect dosage. Atropin



arrests the pains by paralyzing the nerve terminals belonging to the vegetative nervous system. The menstrual discharge increases in amount after taking the atropin, possibly from relaxing the spasmodic contraction of the vessels or of the uterus or both.

Osborne, Dalché and others have discussed the use of thyroid and ovarian extract in dysmenorrhea. When no definite cause may be found a course of thyroid treatment may restore the balance between the internal secretions. Frequently it is effectual in regulating menstruation, increasing the menses to normal proportions and without abnormal pain. Small doses of pulverized thyroid, 0.025 to 0.05 or even 0.1 gm. a day, may be given, keeping this up for a month or more to get the full benefit of its stimulating and regulating action on the functioning of the ovaries. The patient must be kept under close supervision during the course, suspending the organotherapy if the pulse goes over 100, or at least materially reducing the dosage. After the first month the thyroid treatment is continued only during the ten days preceding the date of menstruation. Sometimes it is better to alternate ovarian and thyroid treatment, thyroid in the morning and ovarian tissue at evening, or give the ovarian treatment continuously for three days and then the thyroid continuously for the same length of time and then resume the ovarian treatment.

#### GENERAL TREATMENT

To relieve severe pain during dysmenorrhea sodium bromid may be given. The salicylates may be prescribed; perhaps 10 grains three times a day of sodium salicylate. Opium is contraindicated because of its habit-forming possibilities.

Macht has suggested the use of benzyl-benzoate in this disease. He used a 20 per cent. alcoholic solution of the drug flavored with some carminative, giving a dose of from 10 to 30 drops in cold water. Litzenberg (*Jour. A. M. A.*, 73:601, 1919) found that patients complained bitterly of the unpleasantness of this solution, especially the aftertaste, so Professor Hirschfelder made up a 20 per cent. emulsion with acacia in aromatic elixir of eriodictyon which proved a much more pleasant medicine to take.

In dysmenorrhea not quite as complete relief as desired was secured with the dosage recommended by Macht, so the dose was increased to 1 teaspoonful and finally to 2 drams given every two hours. No bad effects followed from this greatly increased amount, unless an occasional case of vomiting and rarely a feeling of weakness might be so attributed.

The prescription used is given herewith.

	Gm.
R Benzyl benzoate .....	10
Mucilage of acacia.....	5
Aromatic elixir of eriodictyon .....	35
Give from $\frac{1}{2}$ to 2 teaspoonfuls, according to necessity.	

The drug may also be obtained in soft capsules, several preparations being listed in New and Nonofficial Remedies.

Relief may be obtained from hot applications on the feet, front of the legs and inner side of the thighs, with moist heat to the abdomen. The patients should guard against constipation. The search for the cause should be most thorough and if the condition persists and no cause can be found one should not hesitate to seek special advice and consultation.

### ASPHYXIA NEONATORUM

This condition is one which every obstetrician should be prepared to treat promptly. In milder degrees it occurs in a large proportion of deliveries. In its more severe forms it fortunately is less common.

The more common causes of the condition are premature detachment of the placenta; prolapse of the umbilical cord; excessive use of chloroform, of chloral, or of morphin administered to the mother to diminish the pain of labor; or large doses of ergot given during the second stage of labor to increase the contraction of the uterus; extreme compression of the head of the child owing to the unusually severe contractions of the uterus separated by brief intervals; obstruction to the passage of the head by narrowness of the pelvis; compression of the head by unskilled delivery with forceps; compression of the after-coming head in the

delivery of breech cases; and compression of the cord through its being wound around the child's neck, or through its being drawn into a knot.

#### PREVENTION

The preventive treatment naturally is based on a consideration of these causes. In instrumental delivery great pressure on the head of the child should be avoided, and the traction should be made intermittent and not continuous. If there is prolapse of the umbilical cord, it should be replaced, the woman placed in the knee-chest position, and every effort made to retain it until the head has become engaged in the brim of the pelvis. In all severe labors preparation should be made before the birth of the child to apply suitable treatment in case it should be born in a condition of asphyxia. These preparations should include a baby's bath tub with a supply of warm water conveniently at hand, a bowl of cold water, a warm woolen blanket, a small piece of gauze, and a hypodermic syringe.

A soon as the child is born it should be promptly slapped repeatedly on the buttocks and back. The mouth and throat should be wiped out with a piece of gauze so as to clear out any blood, mucus or amniotic fluid which may be there. If this does not promote the reflex action of breathing, the cord should be felt to see if it is pulsating.

By this time one has had an opportunity to inspect the surface of the child to see whether the condition is one of *asphyxia livida*, in which the skin is congested and livid and the reflexes are maintained; or whether the condition present is *asphyxia pallida*, in which the surface is pale and cold, the muscles are relaxed, and the reflexes are absent. The treatment should vary somewhat according to which of these two conditions is present.

#### ASPHYXIA LIVIDA

If the condition is one of *asphyxia livida*, with congestion of the skin, there is some difference of opinion as to whether the cord, if it is pulsating, should be at once cut and a small amount of blood allowed to escape, or whether it should not be cut until later. Probably it is wiser to postpone this for five or ten minutes. In

the meantime the child should be grasped by its feet in the left hand of the physician and held in an inverted position while several light blows are administered on the buttocks, shoulders and chest, in order, if possible, to expel any more blood or mucus which may be in the larynx and trachea. This position should be maintained for only a few seconds.

#### ARTIFICIAL RESPIRATION

Next, the Byrd Dewey method of artificial respiration should be tried. This consists in placing the palm and fingers of the right hand under the child's shoulders, while the index finger and thumb support its head, the left hand being placed under the hips. With the child in this position, by raising the radial sides of the hands, the legs and knees of the child are brought up onto its chest and the chest is compressed so that the air is expelled; then reversing this position and allowing the head and shoulders to fall backward, the chest is expanded and the air drawn in. These maneuvers should be repeated at intervals of about five seconds, so that the procedure will be repeated from ten to fourteen times in a minute. If the cord is of average length, this can be done before the cord is cut.

If the cord has not been cut before, it should be now, and the child at once placed in a tub in which water of a temperature between 100 and 105 F. has been placed. This will promote the circulation in the skin and prevent the body from being chilled, and further treatment may be carried out.

The next method of encouraging respiration is that known as the method of Laborde. This consists in grasping the tip of the tongue either with the thumb and finger, with the aid of a piece of gauze, or with forceps, and drawing it forward and then letting it fall backward. This should be repeated from ten to fourteen times a minute, and may be continued for one or two minutes. While this is being done the child should lie with the head drawn slightly backward, or on one side.

If the child does not breathe by this time, it is well to take it out of the warm water and plunge it into a bowl of cool water of a temperature of from



65 to 75 F. It should be allowed to remain here but a few seconds, and then placed back in the warm water. In the meantime it should be vigorously rubbed, but at the same time caution should be used not to rub it harshly for fear of doing serious damage to the skin.

In some cases it has been found that inserting the tip of the little finger into the anus will stimulate the reflex action of breathing.

Another method not infrequently employed is that known as the method of Schulze, which consists in standing back of the child, placing the palmar surfaces of the three outer fingers under its shoulders, the index finger of each hand under the axilla, and the thumbs on the chest, with the ball of the thumb resting on each side of the child's head. The physician thus grasping the child and then standing erect, gradually swings the child forward and upward in front of himself until it is above his head. In this position the child's thighs and legs fall against its chest, which is thereby compressed and the air forced out. Then swinging the child back into the original position, the chest is expanded, and the air enters. This may be repeated at intervals of five or six seconds, so that it will be done from ten to fourteen times in a minute. This is a method which presents more or less of the appearance of violence, and hence it is not always practicable to do it in the presence of the friends of the patient. It should also not be practiced if there are fractures of any of the bones, or if the child is especially feeble, or has been born prematurely.

If difficulty has been experienced in clearing the larynx and trachea of mucus, a small soft catheter may be inserted through the larynx into the trachea, and any mucus present drawn out, either by the physician himself or with the aid of a syringe or aspirator.

If other methods fail, it is recommended to blow air into the lungs of the child. This may be done by the so-called mouth-to-mouth method in which, a piece of gauze being placed over the mouth of the child, the physician filling his cheeks with air expels it into the mouth of the child, at the same time holding the child's nose. This method is somewhat inexact, as

much of the air frequently goes into the stomach, but some of it goes into the lungs, if they are not already distended. After blowing air into the lungs, the chest should be compressed so as to drive it out again.

An effective method of resuscitating asphyxiated infants is that of Meltzer and Auer, by tracheal insufflation. A rubber catheter is passed into the trachea as far as the bifurcation and air is pumped into the lungs by means of a rubber bulb, the pressure being regulated by a mercurial manometer connected with the apparatus. The return air escapes alongside the catheter.

A few drops of ammonia on a piece of linen may be held under the child's nose, but not too closely, with the hope that this will stimulate respiration and, as it sometimes does, muscular contraction. A hypodermic injection of a drop of tincture of belladonna or 1/1,000 of a grain of strychnin may be given.

If by the time all these methods have been tried the child has not commenced to breathe, the physician naturally wonders how long he ought to continue his efforts. The answer to this question depends largely on the condition of the heart. He should continue his efforts at artificial respiration and external stimulation as long as the heart beats. After it has been impossible for five minutes to detect any pulsation of the heart, it is useless to continue any further efforts at resuscitation.

If the efforts have been successful and the child commences to breathe, even if the breaths are taken at long intervals, one should avoid an over-anxiety in interfering with the natural performance of the function by the child. Once it has begun to breathe it probably will continue to breathe and the breaths will increase in depth and frequency until they become normal.

#### ASPHYXIA PALLIDA

Turning now to the other class of asphyxia neonatorum, viz., *asphyxia pallida*, in which the reflexes are absent and the heart is weak; if the cord is not pulsating, it should be immediately cut and the child placed in a tub of warm water. If, however, it is pulsating the child should not be separated from the mother until the pulsation has ceased. The same

methods are applicable in these cases as in the others, except that the more violent ones had better be omitted and all efforts concentrated on the employment of the milder methods, especially the rhythmical traction of the tongue as practiced by Laborde. Especially is it important to maintain the temperature of the child, and the water in the warm bath should be maintained at a temperature of 100 or a little higher by adding fresh warm water as fast as the water in the tub becomes cool.

After the child has gained the ability to breathe regularly it should be carefully watched for several days, for if there has been difficulty in relieving the asphyxia, there is danger that it will become feeble and die in the course of a few days. It should be well wrapped up, and the external heat should be maintained. The milk should be drawn from the mother's breast and fed to it with a medicine dropper, if it is not able to take hold of the breast and draw for itself.

# DISEASES OF INFANCY

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## INFANT MORTALITY AND FEEDING

The amount and extent of infant mortality have been estimated in various ways. In general, all seem to agree that approximately 15 per cent. of all children born die before they are 1 year old. As to the causes of fetal mortality, Williams (*Jour. A. M. A.*, Jan. 9, 1915, p. 95) analyzed 705 fetal deaths which occurred in 10,000 consecutive admissions to the obstetrical department of Johns Hopkins Hospital. Included in this list are all those who died immediately after birth up to those who lived two weeks and died. Of this class syphilis was responsible for 26 per cent.; unknown causes, 18 per cent.; dystocia, 17 per cent.; various unpreventable complications, as hemorrhagic diseases, cord infection, status lymphaticus, strangulation by loops of cord, about 11 per cent.; prematurity, 7 per cent.; toxemia, 6.5 per cent.; deformity, inanition, criminal suffocation, placenta praevia, etc., all less than 5 per cent. The cure for this type of infant mortality is proper prenatal care. This prenatal care means that the physician must examine his cases, make regular urine examinations, see that the expectant mother secures a proper diet, correct and sufficient exercise and a proper hygiene.

Approximately one third of the deaths during the first year are due to congenital malformations, deformities and weaknesses; another third to diarrheal diseases; a little less than one fourth to respiratory and tuberculous diseases; and the remainder to other diseases.

It is toward the diminution of the number of deaths from diarrheal diseases that preventive efforts are conspicuously directed. A very large proportion of these deaths occur during the hot weather between July 1 and October 1, and are directly traceable to improper feeding and improper food. Hence arises the great importance of the problem of feeding the infant.

When the fact is recalled that the milk of different animals varies in composition, it is not necessary at



the present day, and in the present advancement of scientific knowledge, to enter on any argument to attempt to prove that the milk of the human mother is the very best food for the human infant during the early months of its life. Every woman, therefore, who gives birth to a living child, unless she is suffering from some serious disease, should nurse her baby. This course is not only decidedly advantageous to the mother, but is also of the greatest importance to the child.

#### BREAST FEEDING

No artificial method of feeding has ever been devised which is as beneficial as nursing at the breast of a healthy mother. Unfortunately, many mothers object to performing this duty on various grounds; some because they have sore nipples and nursing is painful; others because the baby will not take the nipple, and therefore is given a bottle instead; others because they think that their milk is not adequate in quantity or of sufficiently good quality to properly nourish the baby; others because they think that their health is being undermined by the drain on the system incident to lactation; and still others because they are unwilling to give up social pleasure so as to be available to nurse the baby every three or four hours. All these conditions should be taken into account by the physician, and such as are present in any individual should, if possible, be removed. He should emphasize to the mother the great importance, both to herself and to her child, of providing the natural food from her own breast for her baby. He should also give explicit directions to the nurse in regard to the care of the breasts and nipples so that the latter may not get sore, a condition which not infrequently is accompanied by serious diminution of the flow of milk.

#### CARE OF THE NIPPLES

Inappropriate clothing and nonuse render the nipples soft, and they have to be toughened. Air and water are what is required. The clothing should be loose and light over the breasts; they should be given air baths during the day, and several times during the

day, at least on rising and retiring, the whole breast should be sponged with cold water. If the nipples are particularly tender they can be dabbed in the morning with a little alcohol to harden them, and at night a little glycerin or tannin-glycerin applied to make them pliable.

At the first sign of smarting, indicating a crack in the nipple, it should be treated with alcohol without the slightest delay, or touched with a silver nitrate pencil. Salves and moisture undo what has been accomplished in toughening the nipple.

#### TECHNIC OF BREAST FEEDING

The young, inexperienced mother needs to be instructed in the most elementary details concerning nursing. She is shown how to retract the parenchyma of the breast from the nipple so that the infant's nose will not be buried in the mamma and respiration will not be constricted in this manner. If she trains the baby to grasp the areola as well as the nipple, the milk flows more freely and the nipple is less liable to be traumatized and rendered painful. The nipples should be kept scrupulously clean, and may be washed before nursing, using plain water. The most important stimulus to lactation is vigorous sucking by a healthy infant.

The interval for feeding should never be under two hours, practically never under three hours. Carlson and others have shown that the onset of hunger in infants occurs in from two and one-half to three hours. The three-hour interval is apparently that approved by most authorities, although many good pediatricians insist that four-hour intervals are correct, especially after the first few months. All these matters, however, should be especially considered with the needs of the individual infant and mother in mind. A night feeding between 10 p. m. and 6 a. m. is ordinarily unnecessary.

The nursing mother should have exercise, plenty of rest, and be free from worry if possible. Too frequent feeding of the infant will result in continual dilatation of its stomach and in the production of intestinal disturbances. The proper correction of these

gastro-intestinal upsets lies with the mother. If necessary she may be given a tonic and constipation should be corrected with cascara or some mild laxative.

In the composition of the milk, the fats and proteins are the constituents apt to be at fault. In cases in which the fat is too small in amount, the mother should take cow's milk, cereals, fats, and plenty of exercise, fresh air and sleep. Nursing should be less frequent when the fat percentage is too great. In such cases the child may have colic after feeding, it may have facial eczema, or seborrhea of the scalp; it vomits sour mucus, the stools smell sour and irritate the skin, and on staining with Sudan III particles of fat are visible in large quantity. The reduction of fat excess is difficult. The infant should, as has been stated, be fed less frequently. The diet of the mother should be modified to limit fat-producing substances, the chief of which are the fats themselves. It may be necessary to feed only that portion of the breast milk containing small quantities of fat. The breast pump may be used thus to eliminate the first or last part of the feeding to obviate undesirable surplus of any constituent.

If protein is the disturbing element, causing colic, constipation or diarrhea with mucus stools containing tough white curds, in shape of bean, or peanut-like masses, the mother is probably leading a sedentary life and eating much meat and eggs and highly seasoned food with lack of fruit and vegetables.

### COLIC

In the foregoing are found the causes, and, in a large measure, the prevention of colic. An attack of colic is unmistakable: the child cries violently, the abdomen is hard and distended, the knees are drawn up, and the hands and feet, which are never still, are cold from the intense intestinal congestion. The trouble may be either in the stomach, coming on soon after nursing, or in the intestines an hour or two later. Most mothers know all the mechanical remedies, such as hot applications, enemas, turning the baby over on his stomach, or holding him against her shoulder. It is often necessary to stop feeding

entirely for twenty-four hours. Frequently, diluting the milk by giving water, lime-water, or barley-water before nursing helps. Nursing a few minutes and stopping a short while, or the use of the nipple shield may be beneficial. Good results have been secured with peptonizing powder dissolved in warm water and given before each feeding. Carminatives, milk of magnesia, sodium bicarbonate, magnesium carbonate and bismuth subcarbonate may often be used to advantage.

#### DIARRHEA

As pointed out again recently by Grulee (*Jour. Missouri State Med. Assn.* 16: 366, 1919), it cannot be too strongly impressed on the profession that diarrhea is not a disease but a symptom; that it is perhaps the most frequent symptom which we encounter in infancy; that it is apt to occur in almost all of the disease processes at this age, especially in acute diseases. The question of its importance depends on the relation of the severity of the diarrhea to the general condition of the patient. A slight diarrhea with a high fever means almost invariably that the condition is not of gastro-intestinal origin. And, on the other hand, a very severe diarrhea with high fever usually points to the gastro-intestinal tract as the origin of the condition.

#### LACK OF MILK

When milk is insufficient in quantity the breasts are flabby, and the baby does not seem satisfied. "Instead of nursing fifteen or twenty minutes and falling asleep, some fret and whine and pull at the nipple often for half an hour, while others give up entirely for a few minutes and then try again. The weight remains stationary or shows only a slight gain. There is no colic, no vomiting; the stools are scant, often with an olive-green tinge, and contain no undigested food. However, unsatisfactory weight may be the result of overfeeding as well as underfeeding. It should be remembered, too, that weight fluctuations are common in infants, just as in adults; therefore, the food should not be changed until it has been found that for two or three weeks there has not been an average weekly gain of from at least 3 to 4 ounces. With an abun-



dance of good nourishing food for the mother, regular habits for the mother and baby, and mixed feeding, if necessary, in underfed babies, we always expect favorable results."

#### CONTRAINDICATIONS

Contrary to general opinion, menstruation is not a cause for stopping of nursing. According to Hess and other pediatricians, not infrequently the quantity of milk is somewhat lessened during menstruation, and this may result in the infant becoming fretful, due to insufficient quantity of the feeding. "Under no circumstances," says Hess, "should menstruation be considered an indication for weaning." Tuberculosis and a new pregnancy should be taken as sufficient cause. If milk is insufficient, breast nursing should be alternated with the feeding of correct milk mixtures.

#### INFLUENCE OF POSTURE ON DIGESTION

Smith and LeWald (*Amer. Jour. Dis. Child.*, 1915, April, ix, p. 261) have shown that air is swallowed with the food by many if not by all infants. The erect posture favors eructation of this air; the horizontal prevents it. The horizontal posture, by preventing eructation, is an important cause of vomiting, colic, indigestion and disturbed sleep. The following routine should be followed in feeding every infant: Before feeding, the infant should be held upright to allow the escape of any gas present in the stomach. Immediately after feeding the infant should again be held up against the shoulder of the mother or nurse. He may be patted on the back or gentle pressure may be made on the epigastrium to encourage eructation of the swallowed air. It may be necessary to interrupt the feeding one or more times to hold the child upright to eructate, in cases in which an excessive amount of air is swallowed. After the gas is eructated the child should be put down to sleep, preferably in the prone position and with the head of the bed raised. If restless he may be taken up after a short time to see if there is more air in the stomach. Habitual tongue-suckers need to be held up several times between feedings, as they constantly swallow air. Other suckling habits must be prevented by mechanical restraint.

Feedings should be given at as long intervals as possible, depending on the gastric capacity and the total daily requirements. A feeding should not be taken too slowly. From five to ten minutes are enough as a rule; fifteen minutes should be the maximum time at bottle or breast. The importance of posture and the wrong teaching given to physicians and nurses in the past warrant the emphasis laid on so simple a matter.

#### SUPPLEMENTARY FOODS

The choice of supplementary foods is a difficult problem. Most proprietary foods are high in carbohydrate content. They may sometimes be utilized as sugars in the modification of fresh milk. Cow's milk should be the basis, but when it fails, even after diluting, boiling or peptonizing, one should persist until sure that no food will agree as long as the baby takes the breast. As a temporary expedient, some of the approved proprietary foods may be successful, especially when the fat content in mother's milk is high. Constipation is better controlled by mixed feeding than by any other means; give a bottle of cow's milk with a high percentage of fat, or some laxative food, or frequently milk of magnesia in one artificial feeding daily. After seven months it is best to use mixed feeding in all cases, with the idea of gradually training the infant stomach for the new food that weaning time will add. A 3 p. m. bottle without the nursing should be given, and later an additional one at 10 a. m. Frequently at about 6 months, the mother's milk begins to grow less, and the fat percentage high, and the baby shows signs of fat indigestion. Under such a condition a bottle of milk containing a low fat mixture should be given. When from any cause the mother's health is impaired and the milk is consequently below the standard, the needs of the infant may be temporarily supplied by the addition of artificial foods, thus giving the mother time to recuperate.

#### WEANING

No age limit can be set for weaning. By one year a normal baby will ordinarily wean himself if gradually a bottle of milk mixture is substituted for breast

feeding, and cereals, toast with butter, broth, beef juice and coddled egg are added, depending on the growth and development of the child. Should the weaning time fall during the summer months, however, it is best to continue the mixed feeding until cool weather. At 9 months the average infant weighs about 17 or 18 pounds. Few mothers have milk that will furnish sufficient nourishment for a child of this size. In the majority of instances, where mothers attempt to nurse their babies after 7 months, to the exclusion of other foods, they do so at the risk of grave malnutrition or rickets.

#### WET NURSING

If the mother cannot or will not nurse her own baby, the next best resource is a good wet-nurse. By this means the baby is supplied with human milk, and if the nurse is healthy, and was delivered at approximately the same date as the child's own mother, the substitute will usually prove very satisfactory. But practically, this method of feeding a baby is applicable to only a very limited number of the babies who are denied nourishment at their mother's breast.

#### COW'S MILK

When human milk is unobtainable, the best substitute, from a practical point of view, is cow's milk, because it can generally be obtained in abundance in a more or less fresh state. Its composition is well understood, also the respects in which it differs from human milk. Like everything else in common use, it varies greatly in quality, and some of these variations are intimately associated with unhealthfulness. Years ago consumers were especially disturbed by the abnormal proportion of water which many specimens of milk contained, and which was alleged to have been introduced surreptitiously by the producer or the dealer. This adulteration has largely been prevented by state legislation and the activity of local health boards.

With increasing knowledge of fermentation and putrefaction, and the relation of bacteria to these processes, it became evident that milk, although kept free

from intentional dilution and contamination, readily underwent deleterious changes under the influence both of its inherent tendencies and of extraneous contaminating matters accidentally introduced into it. At present the most important cause of the deterioration of milk and the development of deleterious qualities in it appears to be the growth of bacteria. It seems to be practically impossible, even with the greatest care, to secure milk which is entirely free from bacteria, even when it is first drawn from the cow. Possible sources of contamination are dust and dirt in the air of the barn or dairy, and manure and other dirt loosely adherent to the hair of the cow, the hands and the clothing of the milker, and utensils used in the transportation of the milk.

It would consequently appear that the work of extracting the milk from the cow should be conducted in the same way as an aseptic surgical operation.

Practically, most milk which is furnished to the consumer contains an abundance of bacteria, and an important practical problem is how their injurious effects may be avoided. It has been found that the growth of bacteria is prevented by a low temperature. Therefore, it is apparent that all milk should be cooled to a temperature not above 50 F. as soon after it is drawn from the cow as possible, and it should be kept at a temperature not above 50 F. until it is used.

Through appointment of milk commissioners it is now possible to secure certified milk from certified cows. The number of bacteria and their virulence have been checked and such milk if fresh may be assumed to be safe.

#### STERILIZATION AND PASTEURIZATION

Not so very many years ago the advice was given to obviate infected milk by "sterilizing" it by boiling. It was even advised to sterilize all the milk which was fed to infants. This was soon found to be objectionable (1) because it altered the taste and made the milk less palatable, and (2) because exposure to such a degree of temperature as was necessary to boil milk produced such changes in it, including a destruction of the enzymes, that it was not a good food for infants.



Next, in order to avoid this interference with the digestibility of the milk, it was proposed to subject the milk to such a temperature, below the boiling point, as would inhibit the growth of bacteria and would not make other objectionable changes in it. This temperature was found to be about 140 F., and the process of heating the milk to this temperature was designated as "pasteurization." In recent years pasteurization has been extensively employed, especially in large cities, and unquestionably with a favorable influence on infant mortality.

Two methods are in use, a "holding" and a "flash" method. In the latter the milk is brought to a high temperature and allowed to cool; in the former, it is held from fifteen to thirty minutes at a temperature which kills all organisms and spores. There seems to be little doubt that the "holding" method is preferable.

Infants that are fed on a strict milk diet, and that pasteurized, seem susceptible to such diseases of altered metabolism as scurvy, rickets and purpura. The addition of orange and other fresh fruit juices to the diet will aid in preventing such disturbances.

### THE NERVOUS CHILD

Many a human being is born with an unstable nervous system. The neuroses are seldom of sudden onset but are usually the result of a long series of mental traumas, many of them occurring during infancy. These are recognizable to the careful diagnostician. As pointed out by McCready (*Jour. A. M. A.* 73: 1109, 1919), parental fears are easily allayed when a trusted family physician or consultant, after examining a distinctly hypoplastic nervous child, states that he can find nothing "organically wrong" and dismisses the patient with a tonic and a few vague directions about keeping the child out of school, getting him into the country, or giving him more milk to drink with the optimistic assurance that he is just a little nervous and anemic and will outgrow it after a while. "Equally dangerous," says McCready, "are the pessimistic prognostications of another variety of routinist, ignorant of the value of a proper combination of medical,

hygienic and educational treatment. While some children are born nervous (hereditary causes), some acquire nervousness (disease, habits, etc.) and others have nervousness thrust on them (faulty training at home and at school). To counteract and to remove these causes in their various and combined phases is the duty (and the privilege) of the physician, and if he fails in its exercise he is derelict."

Among the early signs and symptoms of such conditions are digestive disturbances, fretfulness, extreme sensitiveness to light and sound, convulsions, premature or late closing of fontanel, premature or late dentition, precocity or delay in the development of muscular control, in talking, undue sensitiveness of skin and mucous membranes, thumb sucking, head rocking, thigh friction, and manipulation of genitalia. In early childhood they are constipation, perhaps alternating with diarrhea, anorexia, and perversities of appetite, aversion to particular articles of food, night terrors, muscular twitchings, tics and muscular incoordination, stammering, lisping, idioglossia, enuresis, tremors of the fingers on extension, restlessness, irritability, perversity sometimes amounting to negativism, phobias, extreme timidity, fatigability, hyperemotivity, and many other abnormalities of life which will readily occur to the observant physician. If unchecked and uncorrected, aggravation of these symptoms occurs as puberty approaches. Negativism, stereotypy, and the typical "shut-in personality," psychasthenia and that short circuit of consciousness included in the term "neurosis" now develop. From the physical standpoint, the nervous child more than the child of stable nervous system, is likely to present the anomalies, such as marked cranial and facial asymmetry, ocular muscular imbalance, myopia, hyperopia, astigmatism, adenoids and enlarged tonsils, prognathism, irregular dentition, nevi, deviation of the nasal septum, phimosis, etc. He may show evidence of ductless glandular dysfunction, may be obese with short, stubby fingers, or slender with long bones and tapering fingers, may be sexually precocious, or puberty may be delayed, may take on sudden accesses of growth, or may fail to grow at the normal rate.

## TREATMENT

The treatment of the nervous child must begin with his environment. In his own household it is frequently difficult to modify the factors responsible for his ailment. As Strauch (*Amer. Jour. Dis. Child* 16: 165, 1918) points out, children affected with minor ailments will in different environments and surrounded by different persons present great variations in the clinical picture aside from the uniformity of the otherwise, of course, identical diseases, and act differently. Factors not lying within the nature of the pathologic processes themselves, but those of entirely extraneous characters, namely, the influences of the change of milieu, will call forth a change of the symptom complex in its non-obligatory, not organically caused, features; the impressionable plastic psyche of the child being affected by the transformative circumstances as clay or wax is shaped under the hand of the modeling artist.

If the child remains at home his entire life must be absolutely guided by the physician. Domestic arrangements must be modified as the physician directs. Rest is of great importance. The child should not be overstimulated in its studies and should have sufficient sleep.

## SLEEP IN CHILDREN

In a special study of sleep disturbances in children Strauch (*Amer. Jour. Dis. Child*. 17: 118, 1919) has classified those due to organic disease, extraneous causes, idiopathic types, stereotypias, motor irritation phenomena, dream types, somnambulism, pavor nocturnus, hypnalgias, insomnia, environmental and sexual factors.

Among organic factors responsible for troubled sleep is pain due to colic, distress or discomfort in gastrointestinal disorders; even slight nutritional disturbances cause babies to sleep poorly; likewise hunger as a result of a sudden diminution of the wonted amount of food, whilst in chronic underfeeding babies rather often will become accustomed to the small quantities; itching and irritating or painful skin lesions, as eczema, urticaria, strophulus, intertrigo and furuncles, the latter especially if exposed to pressure

during sleep. Where sleep-disturbed nights precede the outbreak of urticaria it is probably due to the at first latent digestive disturbance that underlies both conditions. It is important to keep in mind that otitis media in the child—especially to be considered during epidemics of grip—may evidence itself by no other symptom than moderate fever and sleeplessness, resulting from pain which is not localized by the infant, and thus easily overlooked. Fever itself may cause sleeplessness. Respiratory obstructions and subsequent discomfort associated with adenoids, rhinitis or dyspnea, may cause awakening, starting with gasping for air and feeling of suffocation. Anemia and rickets cause restless sleep as a nervous system. In this condition administration of phosphorus and cod liver oil may act almost as a specific. Likewise irritation of chorea, tetany and athetosis prevent sleep.

Among extraneous causes of troubled sleep Strauch mentions deficient ventilation, lack of comfort, lack of quiet and darkness, faulty temperature of the room, with overheating or cooling of the body, exposure of feet in a cold room, lying wet. Too low temperature, insufficient covering will, especially in the morning hours, disturb sleep, as they act as awakening stimuli. The depth of sleep in infants depends on retention of warmth. Discomfort of the resting place comprises also the sleeping in the same bed of several persons. Whenever possible the child should certainly sleep alone.

Unfavorable crowded home conditions of the poor cause the younger children to be habitually deprived night after night of their full quota of sleep by the late retirement of the older persons of the family. Occasionally overburdening in school work, too much mental exertion, perverted distribution of the day hours, premature and untimely participation in social affairs and pleasures of the adult, especially dancing, abuse of alcohol, tea, coffee and tobacco, and even sexual stimuli, home work and home industry until late hours, will, by habitually curtailing the minimum sleep requirement, exert a detrimental effect on the young. Such children soon suffer in their general state of health; the appetite decreases, they often have head-



ache, the mucous membranes lose their healthy hue; skin, muscles and panniculus adiposus become flabby and the youthful, frolicking nature with its love for work is replaced by inattention, fatigue and reduced efficiency in school work; finally, they become nervous and suffer from insomnia, establishing thus a vicious circle.

Children often have the habit of falling asleep in a certain fashion; as, for instance, with their playthings, a favorite toy animal or a doll, at their side, or with the corner of the bed clothes or one or more fingers in the mouth; some will suck the finger only when falling asleep, though not at other times, this being apparently an agreeable sleep promoting stimulus. Other children will bite their nails, pull the bed cover over the face, will insist on a certain posture, lying on the stomach, or on the bent knees, or display some other preferred position and habit. The mothers know these little habits, perhaps being responsible for the development of such stereotypias, and are aware of the fact that the child will refuse to sleep if hindered in this peculiarity. If this habitual act is made impossible, falling asleep will be hindered. As Strauch indicates, some of these peculiarities are normal, but in many instances their similarity, degree and persistency may point to a neuro-pathic basis.

Among motor irritation phenomena are jerking of the body, twitchings of leg or arm, rolling and tossing, grinding of the teeth, etc. During dreams the child may laugh, speak or cry, make sucking movements or even sit up in bed. With sufficient stimulation somnambulism appears. Night terrors may be produced by disturbances of the nervous system or by horrible dreams associated with mental traumas received in the waking state. These may be associated with environmental factors; frequently parents tell children unwholesome morbid stories or intimidate the child with the boggy man, or by physical threat. In many such instances the child fearing to sleep alone will permanently ask for this or that or for an adult person to sit at the bedside, but then will distrustfully open their eyes time and again to see whether the person is

still present. Instinctive, indefinite fear of darkness may, especially in nervous children, prevent or otherwise disturb sleep.

#### TREATMENT OF SLEEP DISTURBANCES

A careful study of the child with the various causes of sleeplessness in mind will indicate the primary factors in treatment. The external factors must be first controlled. Possible lack of comfort, hygiene and the other disturbing extraneous circumstances already mentioned must be considered. The child's sleep should not be disturbed. Such bad habits as singing or rocking to sleep, feeding or drinking during the night, taking up the child or fondling it when it cries should be forbidden. Especially difficult to treat are the fears affecting sleep. "The more certain it is that fear-affects interfere with sleep," says Strauch, "the more must we make efforts to free the victim of them by removing the psychic sources. It would be cruel not to alleviate dread. It may be necessary to keep the door open, so the child will know that a person is near by, or to keep a light burning low, to be turned down soon, of course, and extinguished finally, until in a few days, as a rule, the child will fall asleep alone in the dark room." The mother may calm the child by suggestion. It may be necessary completely to alter temporarily the child's psychic life. A system of rewards sometimes works wonders.

Among physical measures, hydrotherapy has first place. A warm bath or warm pack and prompt return to a warm bed is very effective. In the treatment of disease conditions drugs should be administered symptomatically to secure the child the needed rest. In the chronic forms drugs are to be used most sparingly if at all.

#### GENERAL TREATMENT OF THE NERVOUS CHILD

No subject is receiving so much attention nowadays as questions of nutrition. Through school clinics, nutrition institutes and popular medical literature the proper feeding of children is being brought to the attention of the public.

Equaling the importance of the prevention of over-fatigue is the regulation of the diet. Malnutrition

affects not only those of narrow means but a large percentage of children from well-to-do homes are undernourished. The diet of the child, while perhaps not necessarily deficient in calories, is frequently composed mostly of carbohydrates, generating an evanescent energy, but failing to provide for tissue wear and tear, for growth and for storage for emergency. Such diet, also, is poor in vitamins and mineral salts; nervousness in children is often as much a deficiency disease as is scurvy or beriberi.

Fresh air, bathing, regulated exercise and other good hygienic habits are important in the management of the nervous child. In many instances a trip to the country is followed by complete rehabilitation of the mental as well as of the physical constitution of the child.

#### SPECIAL TREATMENT OF PSYCHOGENIC DISTURBANCES

Most of these disturbances are readily treated by physical means, combined with a mild psychotherapy. It is necessary to remove the child from irritative factors or personalities. In many cases intentional neglect of the child's morbid manifestations reduces his sensitivity.

In hysterical children, Strauch believes an alteration of the milieu must be radical and comprise not only a change of place, but in addition, also the absence of visitors, especially the separation from family members, the leaving at home of toys and books or other objects that have been in frequent use by the child and therefore are closely connected and interwoven with his manifold associations and morbid complexes of ideas and emotions.

The child may benefit greatly by meeting and playing with healthy and vigorous children; this will divert his attention from his physical condition and the imitative instinct of the neuropath by being directed into other channels will be utilized in bringing the child back to normal habits and tendencies. Psychotherapy through simple verbal suggestions, particularly with the support of appropriate apparatuses, auxiliary manipulations, as massage, medication or other supplementary physical means, that impress themselves on the child's

mind as wonderful, mysterious or novel, and mask the psychic element of the treatment, has a strong influence toward recovery. In many instances the mere authoritative word, the emphatic and positive assurance of cure, or, according to the individuality of the patient, gentle persuasion, the use of a placebo, or a system of rewards and punishment works an immediate cure, once the physician gains the child's friendship and confidence.

The physician must have full confidence in his own ability to master the situation. If the first psychic blow falls very short of its goal and the prediction fails of early realization, the child's trust and faith in the curative force is considerably shaken and the probabilities of a cure by the same physician reduced. In cases of palsy it is often important to prove to the child that he can use his limbs much better than he supposed. "As a last resort, if not used at the first," says Strauch, "a more powerful means, impressive through unpleasantness or even painfulness, will find its proper place; as for instance, the faradic current that even in tics, a usually obstinate affection, has proved to be of great curative value. Also cold baths, subcutaneous injections, bitter or disagreeable medicines and other measures of a disagreeable character come here into consideration."

### CONVULSIONS IN YOUNG CHILDREN

Convulsions in infants are not a disease entity, but the demand for prompt treatment in every case has caused them to be considered as a group rather than in direct relation to the underlying cause. Needless to state, the condition usually means a hyperexcitability of the nervous system. This may be related to heredity, the parents being neurasthenic or neurotic; to lowered vitality; to errors in nutrition, most frequent in those artificially fed; to chronic diseases such as rickets, syphilis, tuberculosis; or to some derangement of the glands of internal secretion. These rather general causes may be further exaggerated by the presence of such exciting conditions as acute pain due to local infection; continued irritation, due to elongated prepuce; to this type also may be referred those cases



undergoing dentition. Because of the incoordination of the nervous system, infants seem especially predisposed to convulsions; but the fact that the convulsion may be a manifestation of any acute infectious disorder, perhaps involving the nervous system, should not be overlooked. It is possible also that the convulsions may be the first indication that the child is epileptic.

The convulsions in young children may be divided into: (1) Those due to cerebral irritation (spasmophilic); (2) those due to cerebral inflammation; (3) those due to acute cerebral congestion or to severe toxemia; (4) **epileptic**.

1. The spasmophilic type is the most frequent, and may occur as a complication of any condition or disease. Irritation due to the eruption of the teeth is a rare cause of convulsions, unless there is some other etiologic factor present. Worms do not frequently cause convulsions, unless sufficient alimentary disturbance occurs simultaneously.

Infants with this type of convulsions often have been artificially fed. Gastro-intestinal disturbances are the most frequent exciting cause of convulsions in children. If meningismus to the extent of convulsions occurs at the beginning of, or during, some acute disease, it still may represent an irritation of the cerebrum from improper food or from improper care of the bowels, or from bad general hygiene, as bad air, insufficient bathing, skin irritations, or other general causes. In other words, convulsions rarely occur in the beginning of the exanthems in normal children. Probably a mild acidosis may be an underlying cause, especially if the child has been vomiting and has not had sufficient carbohydrate nutrition for a number of hours.

Spasmophilic convulsions may be recognized by increase of all reflex irritability, restlessness and sleeplessness. If a test is made, there will be found to be also an increase of electric irritability.

Some spasmophilic children may have convulsions with very mild exciting causes, as an acute indigestion, or the beginning of one of the exanthems, or with the high fever of a tonsillitis or a bronchitis. Later in life these individuals are likely to have high fever with the

least infection, and may be delirious with any high temperature. They are likely to be neurotic, high strung, irritable, and to display temper as children. A breast-fed baby is often immune against such spasmophilic attacks. This emphasizes the importance of the absorption of toxins or irritants from the intestines as an exciting factor in spasmophilic convulsions. The most frequent age at which these convulsions occur is the age when an artificially fed infant is most likely to have gastro-intestinal disturbance, namely, from about the third month to about the end of the second year. Of course they may occur at any age thereafter.

After a spasmophilic convulsion the patient does not sleep as he does after an epileptic convulsion, and the spasmophilic patient may have what has been termed spasmodic croup, or laryngospasm. This laryngeal tetanic condition may be sufficiently prolonged to cause death.

True epileptic attacks may begin in infancy, and even in very young infants. The diagnosis may be made by the fact that spasmophilia rarely occurs in infants under 3 months of age, that contractions of the face and spasm of the larynx do not occur in epilepsy, and that increased electric excitability is a sign of spasmophilia. Also, as just stated, after a spasmophilic attack the patient generally does not sleep. Spasmophilic convulsions are likely to be multiple in number, while in the young child the epileptic convulsion is generally single, with longer or shorter periods of complete freedom from convulsions.

#### TREATMENT

The treatment of spasmophilic convulsions is purgation, unless the child has already had a severe diarrhea. Breast milk should be given if possible, if the patient is an infant; otherwise, the food should be starchy, as barley water or thin oatmeal gruel. Some alkali, as potassium citrate, is advisable, such as:

	Gm. or C.c.	
R Potassii citratis.....	2	gr. xxxvi
Aquae menthae piperitae.	100	fl̄ss iv

M. Sig.: A teaspoonful, in water, every three hours.

Lime water should be given in teaspoonful doses five times a day. It is quite probable that the parathyroids are disturbed in all cases of spasmophilia, and calcium is a sedative to these glands as well as to the nervous system.

If a mild sedative is deemed advisable, bromid may be given, best as sodium bromid, about 0.065 gm. (1 grain) for every year of the child's age, best given in plain water and repeated every two hours until the child is asleep; then the drug should be stopped altogether, if possible. In severer cases bromid is not successful, even in large doses, and chloral must be given, better by rectum, perhaps 0.13 gm. (2 grains) in an ounce of warm water and repeated in four hours, if needed. This dosage is for a child from 1 to 2 years of age. Cases of this type also show improvement under administration of phosphorated cod liver oil and the elimination of whey from the food, substituting albumin milk.

The convulsions may be so severe and so frequent as to endanger the life of the patient; hence in such cases the treatment must be rapid and strenuous. Chloroform inhalations may be life-saving, and if convulsions recur as soon as the anesthesia is over (often primary anesthesia is all sufficient), it may be necessary to give opium in some form. A hypodermic injection of a small dose of morphin, depending on the age of the child, may be given. At the same time it should be remembered that morphin may act excessively in young children.

The quieting effect of a tepid bath or of warm sponging must not be forgotten. If the child is exhausted it may be revived by stimulating the respiration by ice cold ablutions to the chest and abdomen.

2. Convulsions due to inflammations of the meninges or to localized abscesses are much more frequent in children than in adults. First, the ears should be carefully examined, as an abscess of the middle ear may not have been suspected, and may be the cause of the condition. Trouble in the ears or mastoid being eliminated, spinal puncture should be done and a careful examination made of the fluid withdrawn.

The treatment of convulsions from some cerebral tangible cause is that of the disease found. Warm baths and bromids, and an ice cap to the head may alleviate the cerebral irritation.

3. That young children often have one or more convulsions in the first stage of an acute infection is a fact, but such convulsions are not so frequent as many textbooks would lead one to suppose. Such convulsions are often perhaps due to an exaggerated anaphylactic reaction caused by the toxins of the infecting germ. Or, in a patient who has inherited a neurotic tendency and is of spasmophilic type, sufficient cerebral congestion may be caused by a severe introductory chill to produce a convulsion. Many times, however, it is associated intestinal indigestion and the absorption of toxins from the intestine that cause the convulsion.

The treatment is simply cool or tepid sponging to lower the temperature, which has generally developed by the time the child is seen, and a small dose of some antipyretic, as acetanilid, perhaps 0.015 gm. (one-fourth grain) to a child 4 years old, every two hours for four doses.

Terminal convulsions in severe illness represent serious toxemia, and can be combated only by treatment aimed at the general condition present, namely, to reduce very high temperature; to stop excessive pain (often forgetting in a child; to relieve intestinal stasis; to brace a failing heart; to prevent collapse, if possible; to combat uremia, if present, etc.

4. It should be remembered that true epilepsy may begin in infancy; consequently, if a child has an occasional convulsion, and no acute inflammatory cause can be found, and especially if it is decided to be a true epileptic convulsion, every reflex irritant cause must be looked for and removed, if possible. There may be several factors causing epilepsy. A family history of epilepsy, chorea, alcoholism and mental disturbances, or instances in the family of mental defect will aid in the presumptive diagnosis that the child is beginning the disease of epilepsy. While the first sign of a true epilepsy may be a distinct convulsion, many times, especially in older children, the disease is preceded by a series of fainting spells or other petit mal attacks.



A possible recurrent acidosis must be considered; hence the diet of a young child should be so modified as to supply plenty of carbohydrates, and it may be wise to give alkalis for a prolonged period. In increasing systemic alkalinity, however, it must be remembered that too much alkali may allow inflammations of the skin and cause bladder irritability.

The mouth, nose, throat and genitalia must all be proved normal or else must be under suspicion as irritating causes of the convulsions. Headaches must, of course, be explained or seriously considered, if there is a history of such. Because there has been an injury, or because some slight depression on the skull is found, does not prove that such is the cause of the epileptic attack. A careful study of the part of the body in which the convulsion begins will often show the motor center that is in trouble, and may give the indication for operative interference.

### ACIDOSIS IN CHILDREN

It has long been known that acidosis is a termination in diabetes mellitus, but that this serious condition may occur in any acute disease when there is prolonged vomiting, starvation, or even when the food is for a long time starch-free, is not always known or often guarded against. The vomiting after anesthesia, and the long continued administration of albumin water or other pure protein food after operations predispose to acidosis; and collapse, shock and gastric disturbance are often due to this factor. While adults are not exempt from gastro-intestinal disturbances that may cause a condition of acidosis, children often suffer from the condition, and it has even been reported as occurring in epidemic form among young children.

It seems unprofitable to discuss theories of the cause of this acute acidosis until more scientific data have been developed. Suffice it to say that an overworked or disturbed liver seems to be unable to care for the fat offered it, and acetone products and resulting acidosis are the consequence. Whether a toxin is formed in the intestine or is absorbed from some distant infection, or from an infection of the nose, throat or lungs (as apparently so prominent in Metcalf's

cases) which interferes with the liver activity, is not known. Many conditions might furnish such a toxin. There is probably always severe liver disturbance in the acidosis of diabetes mellitus.

Acetone bodies are neutralized by the sodium, potassium or calcium of the blood and tissues. Hence the great loss of these alkaline elements if the acidosis persists, and the need for large amounts of alkaline salts to save the patient.

### SYMPTOMS

The onset of symptoms in acidosis is usually sudden, and generally the disease begins with vomiting. The most prominent symptoms are coated tongue, drowsiness, thirst, flushed face, prostration, diarrhea (about one third of the cases) and cerebral symptoms. The fever varies from a little above normal to 104, while in some of the most serious cases there is a low temperature; the pulse is rapid, and follows the temperature—the higher the temperature, the higher the pulse rate. With the prostration there is frequently a paleness about the mouth, quite noticeable; there is often dyspnea, and acidosis in any condition is a common cause of dyspnea or hyperpnea; the urine is scanty and generally clear, though sometimes cloudy; acetone is present and persists until after the urine becomes alkaline under the treatment. Diacetic acid may also be present; it is a danger signal, and, if the patient recovers, it disappears from the urine before the acetone disappears.

### TESTS FOR ACETONE AND DIACETIC ACID

*Acetone.*—To 5 c.c. of urine in a test tube add a small crystal of sodium nitroprussate and a few drops of strong acetic acid, and shake. Make alkaline with ammonium hydroxid. A purple color indicates acetone.

*Diacetic Acid.*—To 5 c.c. of urine in a test tube add an excess of a 10 per cent. solution of ferric chlorid. A dark brownish red color indicates diacetic acid. Some drugs (salicylates) give this reaction, but it does not disappear on heating as it does when due to diacetic acid.

## TREATMENT

The treatment, from start to finish, consists of the administration of alkalis, either sodium bicarbonate or potassium or sodium citrate. Most children can take and retain large doses of these drugs. If not retained, the alkali is given by the rectum. The doses must be large, to quickly combat the acidosis. The sooner the urine is rendered alkaline the better for the child. Four grams (60 grains) of sodium bicarbonate every two hours is about the amount desired. Smaller amounts act much more slowly. Full doses will alkalize the urine in from twenty-four to thirty-six hours. The more serious the symptoms, the more necessary it is to push the alkali. Sodium bicarbonate may be given as follows:

	Gm. or C.c.	
R Sodii bicarbonatis .....	20	3 ivss
Aquae .....	200	fl 3 vi

M. Sig.: Two teaspoonfuls, in an equal amount of water, every thirty minutes.

This dose is for any age, and is to be continued until the urine is alkaline, or at least until eight doses have been taken. The frequency may then be reduced to once in two hours, and then the dose may be given more or less frequently, depending on whether or not the urine is alkaline. If the intoxication is serious, the dose should be given every fifteen minutes.

If the medicine is not retained, peppermint water or wintergreen water may aid in its retention; or it may be given by rectum, 2 grams (30 grains) in 2 ounces of water, every hour; or potassium or sodium citrate may be substituted:

	Gm. or C.c.	
R Potassii citratis .....	40	3 ix
Aquae gaultheriae .....	200	fl 3 vi

M. Sig.: Two teaspoonfuls, in an equal amount of water, every thirty minutes.

This dose is for any age, and should be continued, increased or diminished in frequency as described for sodium bicarbonate, depending on the condition. Whatever the alkali used, it should be continued for several days in diminishing frequency of dosage even after the acute symptoms have subsided.

Howland and Marriott suggest intravenous administration when vomiting and diarrhea prevent administration by mouth or rectum. Intravenous administration is the method of choice, especially when rapidity of action is desired; and with acidosis, rapidity of action is always desired. The superior longitudinal sinus is available with infants, or the external jugular or femoral veins. With older children, a vein in the arm can often be employed. If facilities for the intravenous injection of alkali are not at hand, the injection may be made subcutaneously, with care that the bicarbonate has not been transformed into the carbonate, else severe sloughing of the tissues may result. A 4 per cent. solution is usually employed for intravenous use and a 2 per cent. solution for subcutaneous use. The quantity to be injected depends on the size of the child, the severity of the symptoms and the effect produced, but the amount is always large. It must be given until the urine becomes alkaline; even in infants under 1 year, as much as 10 gm. in twenty-four hours may be required. With the cases of acetone body acidosis, with no sugar in the urine, and with a low sugar content of the blood, glucose by the rectum, subcutaneously or intravenously, seems clearly indicated in addition to the alkali. With all forms water is urgently required, especially with infants who are dehydrated as a result of vomiting and diarrhea. After one or two intravenous injections, the soda should be continued by mouth in doses of 1 to 3 gm. every two or three hours until the urine is alkaline to litmus. In all cases of severe diarrhea, even though there are no evidences of acidosis, the authors deem it advisable to use sodium bicarbonate until the urine is alkaline. Its administration may prevent the development of acidosis.

#### AMMONIACAL DIAPERS

It may be noted that if the urine is made long alkaline, ammonium compounds may appear in the urine, and in infants who wear diapers this ammonia may combine with any alkali present in the diaper, such as "soap, lye, lime or stool," and cause severe irritation



of the buttocks. Hence in these cases the diapers must be thoroughly cleansed of all soap.

#### DIET

The best diet as soon as vomiting has ceased is probably barley water, oatmeal water, rice water, and soon afterward cereal gruels.

When there is great "excitement" small doses of bromid or chloral should be given.

#### ACUTE DIARRHEA IN INFANTS

It is not our purpose to discuss this subject elaborately, but merely to recall a few therapeutic suggestions.

1. With beginning abdominal disturbance we must consider, in infants, typhoid fever, dysentery, appendicitis, and infection of the kidneys, to say nothing of more serious conditions, as obstruction. During a diarrhea we must watch for symptoms of acidemia, and for meningeal complications.

2. Eruptions that may be present may be due to food poisoning, other protein poisoning, or to drugs.

3. We should seek for sources of focal infection, perhaps in the tonsils or in the ear, or perhaps a serious bronchitis or other lung condition. It should be recognized that streptococcic focal infections may cause diarrhea.

4. The child should always be kept in the fresh air and outdoors, in the shade, if the weather is hot. If possible, a speedy removal to the seashore or to the country is advisable. This therapeutic measure should not wait until the child is hopelessly ill.

5. Castor oil should be given.

6. Food should be withheld.

7. Plenty of water should be given. If the child cannot retain water in the stomach, after a colon wash, it may be retained in the colon. If water is continually lost by the body, and cannot be retained in the stomach or colon, hypodermoclysis is advisable. Many a diarrheal patient dies from lack of water.

8. In twenty-four hours (sooner if the patient is very weak) lactose, in from 3 to 5 per cent. solution, in water, should be given.

9. If the patient is acidotic, starch water and sodium bicarbonate should be given in small, frequent doses. Thin oatmeal gruel may be given.

10. If there are frequent small stools, with considerable tenesmus and pain, the lower bowel should be washed out with 0.7 per cent. sodium chlorid solution once or twice daily. This should be done very gently. If it causes prostration, it should be stopped.

11. While these treatments are going on, the stools should be examined for bacteria, to ascertain what pathogenic germs we must combat.

12. If the stools are fetid, and especially if there is a tendency toward incomplete evacuation of the bowels, small doses of yeast may be given, in water, as one twentieth of an ordinary yeast cake, once a day.

13. Phenyl salicylate, in 0.03 gm. doses for a child 1 year old, may be given every three hours for a day or two, and then every six hours. Older children should receive a larger dose.

14. If there is much irritation of the stomach or upper intestine, milk of bismuth may be given. It should not be given too long, and it is of no value given by the mouth for colitis.

15. If the child is hot, it should be sponged with tepid water and kept cool. If it is cold, it should be kept warm with dry heat. So-called antipyretics should not be given. A good working rule is to keep the abdomen warm, and the rest of the body cool.

16. If stimulation is required, very small doses of atropin, or very small doses of strychnin, or both, may be given.

17. If the child becomes constipated, and the bowel condition is troublesome, another dose of castor oil may be given.

18. The mouth should be kept clean, but all measures should be gentle. The usual antiseptic precautions should be used for all nose and mouth secretions, for the diapers, and for cleansing the clothing and bed linen.

19. It is well to keep petrolatum spread over the anus and buttocks. This prevents irritation from the excretions, and is not conducive to germ growth.

20. As soon as advisable, the food should be increased by giving malted foods or malted gruels, and later by pasteurized milk, but the diet should be kept low until the abnormal temperature ceases and the stools are less frequent and contain no blood.

21. A gradual return should be made to the regular milk or mixed diet of the child.

22. Occasionally, when all measures seem to fail, if the child is a bottle-fed infant, a wet-nurse may be a life saver. If the child is a nursing child, the mother's milk may be at fault, and all possible sources of infection should be sought.

### FOOD FOR CHILDREN FROM TWO TO SEVEN

It is possible to fulfil the requirements of a proper diet and still have a wide choice of foods for children from 2 to 7 years of age. It has been found that a healthy child from 2 to 4 years old requires daily from 1,200 to 1,400 food units (calories); from 4 to 7 years of age the amount should be from 1,400 to 1,700 calories. In general this discussion follows an outline prepared by Drs. L. Emmett Holt, Graham Lusk, L. E. Le Fetra and G. R. Psék for the New York City Health Department.

*Fats.*—Regarding fats, it is said that both animal and vegetable fats are useful as foods, the animal fats being superior, however, and of these the most economical is said to be oleomargarin.

*Carbohydrates.*—The carbohydrates include cereals, vegetables, breadstuffs, sugar and sweets. These are cheaper in bulk, and more expensive when purchased in special packages. When purchased in bulk, oatmeal, corn meal, hominy, samp and rice are most economical. Proprietary ready-to-serve foods are of higher cost and more difficult of digestion by young children, which more than offsets the ease of preparation.

*Vegetables.*—The value of vegetables depends not only on the amount of fat, carbohydrates and protein which they contain, but also on the richness in iron and other important salts, and on the amount of fiber, which aids proper action of the bowels. For these reasons they are indispensable to a proper diet, not-

withstanding their relatively high cost. Spinach, beet tops, chard and other "pot greens" are of particular value. For children of the ages under consideration no raw vegetables, such as radishes, tomatoes, cucumbers, onions or celery, no green corn, peppers, egg plant or cabbage should be allowed.

*Breadstuffs.*—Hot bread or rolls, griddle cakes and doughnuts should not be given to young children, but corn bread should be used for at least one meal a day. Bread and rolls should be stale or dried on the stove or in the oven till crisp.

*Sugars and Sweets.*—No candy or chocolate should be given before a child is 5 years old, and then not more than one piece a day. Not more than one teaspoonful of sugar should be given on a dish of cereal.

*Protein Foods.*—One of the greatest difficulties in furnishing a proper diet at moderate cost is to supply the proteins in the amount needed. These foods as a class cost much more than either fats or carbohydrates. The cheapest and best protein for children is milk.

Fish at certain seasons are cheap and useful. Vegetables high in protein may largely replace meat in the diet, such as beans and peas, fresh or dried, which may be given as soups. Together with milk and bread, they may entirely replace meat. Wheat and oats contain most protein. Among the protein foods interdicted for children are sausage, pork, ham, liver and smoked salt or dried fish.

*Fruits.*—Fresh fruits, though expensive except for the short time when they are in season, should be given freely. Berries, cherries, pineapple and plums should not be given, since they are not easily digested, and are usually expensive. Bananas should be thoroughly ripe, or else baked or boiled. The more extensive use of stewed dried fruits is urged. Fruit should be given with other foods and not between meals.

*Desserts.*—Desserts permitted to young children are plain puddings made from rice, farina, cornstarch or stale bread; custard; junket, ice cream not oftener than twice a week and in small portions, bread with (corn) syrup or jelly; plain cookies, gingersnaps, sponge cake or lady fingers once daily with meals.



Pastries, pies and rich cakes, particularly those made with nuts and dried fruit, are forbidden.

*Drinks.*—Milk, not less than a pint nor more than a quart daily, is cheaper and better than any other food of equal caloric value. It is indispensable for younger children. Cocoa, made with milk, may be substituted for milk in cold weather. Children should drink from two to four glasses of water daily. Tea, coffee, wine, cider and soda water are interdicted.

*Habits to Be Avoided.*—Irregular meal times; entire meals consisting of only one article of food; imperfect chewing of food; rapid eating with much drinking during meals; feeding between regular meals. Coaxing or forcing the child to eat without appetite, should never be done.

*Cooking.*—Cereals should be cooked for not less than one hour, and most of them for three hours. A double boiler or a fireless cooker may be used. Green vegetables should be cooked with very little water; all vegetables should be thoroughly cooked. Potatoes should be boiled with the skins on and peeled afterward, thus saving at least one sixth of the potato. Meats should be roasted, broiled or boiled; neither meat, chicken nor fish should be fried. Roasted or broiled meats should be eaten rare. Eggs should not be fried. Meat stews with potatoes and other vegetables are to be recommended, provided they are thoroughly cooked and the fat has been removed. Clear soups have almost no food value, but when vegetables, barley, noodles or rice are added they are useful foods. Thick soups, especially those made with peas and beans, with the addition of milk, are nutritious and cheap, and can largely replace meat and eggs in the diet.

*Sample Diets.*—Following are sample diets furnishing sufficient quantities of food for healthy growth, but omitting meat on account of its high cost:

#### SAMPLE DIET—TWO TO FOUR YEARS

*Breakfast, 7 a. m.:* Cereal (oatmeal, hominy, rice or corn meal), 2 to 3 good tablespoonfuls with 1 even teaspoonful sugar and 2 ounces milk. Crisp toast or bread (stale), one or two slices with butter. Milk, 8 ounces, from cup.

*Morning lunch, 10:30 a. m.:* Milk, 6 ounces. Bread (stale), one slice.

*Dinner, 1:30 p. m.:* One egg, or cup thick soup. Rice or macaroni, 2 tablespoonfuls, or one small baked potato. Fresh vegetable, 2 tablespoonfuls. Stewed fruit, 3 or 4 tablespoonfuls. Bread, one or two slices, with butter. Water.

*Supper, 6 p. m.:* Cereal, 2 or 3 good tablespoonfuls with sugar and 2 ounces milk. Milk, 6 ounces, from cup. Bread and butter, one slice. Custard, junket or plain pudding, 2 to 4 tablespoonfuls.

#### SAMPLE DIET—FIVE TO SEVEN YEARS

*Breakfast, 7:30 a. m.:* Cereal (as given for two to four years), 4 tablespoonfuls with 1 teaspoonful sugar and 2 ounces milk. Bread (stale white, graham or corn bread) or toast, with butter, two slices. Fruit, one fully ripe banana, peach, pear, or grapes, in season. Cocoa made with milk, one cup, or milk, 8 ounces.

*Dinner, 12:30 p. m.:* Meat stew with vegetables; or soup made with milk and peas or beans; or fish; or egg. Potato, rice, samp or macaroni, with oil or butter. Fresh vegetable (spinach, chard, squash, carrots, turnips, string beans, boiled onions or celery), 3 tablespoonfuls. Bread and butter, one or two slices. Stewed dried fruit (apples, peaches, prunes, apricots), 3 or 4 tablespoonfuls. Ginger snaps or plain cake or jelly sandwich. Water.

*Supper, 6 p. m.:* Cereal as at breakfast, with soup, or one egg. Bread (stale), two slices, with butter or peanut butter. Cup of cocoa made with milk. Plain pudding made with milk; or stale bread with corn syrup.

#### DIET IN GENERAL DURING THIS PERIOD

The diets outlined are chosen with particular reference to economy and healthfulness. When economy is not of chief importance the diet may be varied without injuring its healthfulness.

Eggs when given should not be fried, but may be prepared in any of the other ways except hard boiled. Meat may be given once daily, preferably beefsteak, lamb chop, roast beef or lamb and white meat of chicken. Fish may be given, if fresh and prepared by boiling or broiling.

Potatoes may be given baked or mashed and with the addition of cream. Among the vegetables asparagus tips, spinach, stewed celery, string beans, carrots, and cauliflower may be given (or, rather, should be given), at least once daily.

Among fruits oranges, baked apples and stewed prunes are best, but pears, peaches and grapes may be given when thoroughly ripe and fresh. The juice of berries also furnishes antiscorbutic substances.

### INCONTINENCE OF URINE IN CHILDREN

This troublesome condition occurs mostly at night, and occurs in both boys and girls. More or less involuntary evacuation of the bladder at night is not considered abnormal in a babe or a young child, but when a child is over 3 years of age it must be considered more or less pathologic. Among the most frequent causes are worms, elongated or adherent prepuce or adherent clitoris, and the general restlessness and poor sleep caused by adenoid tissue in the pharynx interfering with breathing; less frequent causes are bladder irritation caused by an actual inflammation in the bladder, or by calculi. Of course simple or specific urethritis, vaginitis or any foreign matter in the vagina, diabetes mellitus, and diabetes insipidus may be causes. If none of these is present, it must be assumed that there is a congenital weakness of the sphincter muscle of the bladder, or that the urine is irritable and that there is a congenital hypersensitiveness of the bladder, so that the least distention causes its contraction. The normal desire to urinate probably comes as a rule from the posterior portion of the urethra slightly dilating and allowing urine to trickle into it. If this relaxation of the sphincter occurs abnormally, of course the reflex desire to urinate is abnormally frequent.

If any of the foregoing reflex causes of nocturnal enuresis are present, proper treatment will stop the wetting of the bed. If none are present, recourse must be had to various treatments. Perhaps more valuable than medicinal treatment is a rearrangement of the general management of the child. Newlin (*Arch. Ped.*, October, 1915) states that the method of management that has given him the best results consists in the simple procedure of anticipating the involuntary emptying of the bladder. This is the usual accompaniment of any treatment, but, Newlin says,

when carried out systematically, can preclude the use of drugs absolutely; it gives far better results than when the chief reliance is placed on medicines with only perfunctory instructions as to the actual management of the child itself. This method of handling even obstinate cases of enuresis is rarely carried out systematically, but when it is so conducted gives almost invariably successful results. The chief obstacle encountered is the difficulty of impressing on the mother or nurse the fact that unless the instructions are absolutely faithfully followed the result is failure.

The nurse is given a sheet of paper with the hours of the day and night placed in a vertical row at the left margin under the heading of the day of the week. If the enuresis occurs on an average of every two hours, she is instructed to put the child on the chamber every hour for the first twelve hours. If she finds the clothing wet at any such time the hour is noted on the chart. At night the child is lifted almost as frequently during the early hours, that is, up to 11 o'clock or midnight; after that every second hour is usually all that is necessary for the first night. At the end of the first twenty-four hours she then either has a clear chart or one with several hours marked as indicating the time of the enuresis. On the second day she is guided by her chart of the previous day, and she may extend the length of time between the voluntary urinations, always, however, anticipating the hours marked as "wet" on the day before, placing the child on the chamber at least a half hour before the time indicated.

The diet is important in the general management of such a child, and as soon as it is of such an age that milk is not necessary for its food it is better to restrict the amount of milk, as nearly two thirds of milk must be passed out by the urine. Of course coffee and tea should be eliminated from the diet of all children, especially of children suffering from this condition. The nearer the diet is vegetarian and cereal, the better for the patient, as vegetables keep more water in the intestines and pass more water out by the bowels and less by the urine than does a diet of more or less meat. All fluids should be restricted after 3 or 4 p. m. and the child should be awakened to



urinate when the parents go to bed. Preventing the child from lying on its back and raising the foot of the bed are old methods which are pretty generally known. The object is to prevent, if possible, the urine trickling into the back part of the urethra and starting the vesical spasm.

While the child may be treated psychically, or mentally impressed with different physical treatments, and perhaps in some way frightened into keeping up a nocturnal memory picture of the necessity of waking when the desire to urinate occurs, still, the patient should never be punished, as this is rarely of any value.

Various electrical treatments have been tried, and probably none any more successfully than the faradic with an indifferent electrode over the spine and an active small electrode applied over the bladder, over the pubis and over the perineum, and the current made sufficiently strong to cause more or less contraction of the tissues. Theoretically this application of electricity may cause contraction and stimulation of the sphincter of the bladder, but most likely the greatest amount of good is done by the psychic effect on the child. Sometimes the galvanic or constant current, with the large electrode on the spine being the anode and the more active smaller electrode being the cathode and the current allowed to make and break, is successful.

Often the passing of sounds has seemed to be the cause of improvement. In other cases a cold perineal douche, or cold-water spongings applied to the perineum apparently cures the condition.

Medication has not been very satisfactory. Probably the most successful drug is atropin, either in the form of belladonna or atropin sulphate, and the amount given should be sufficient to cause some physiologic action. The dose to begin with would be  $1/500$  grain of atropin sulphate to a child 5 years old, administered at bedtime. This dose should be increased until some physiologic activity is evident. Frequently ergot or pituitary solution is a successful medication, especially when there is a tendency to polyuria or diabetes insipidus. The ability of ergot to stimulate smooth muscle fiber is well understood, and that it is

more or less a sedative to the central nervous system is believed by many clinicians. The ergot is best administered as a thoroughly active fluidextract in doses of 10, 15, 20 or more drops, depending on the age of the child, and given directly after the evening meal.

Though almost any treatment may at times be rapidly successful, it must not be forgotten that many of these cases of nocturnal enuresis end abruptly without any special treatment, and the most inveterate cases frequently have the trouble cease at puberty, owing probably to a better development of all the muscular tissues of the genito-urinary tract.

# PHYSICAL THERAPY

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## THE LOCAL APPLICATION OF DRY HOT AIR

The general practitioner will usually not be able to apply the major elements of physiologic therapy to any great extent, because of the elaborateness of the plant required, but some of the minor elements can be perfectly utilized by the general practitioner, and most gratifying therapeutic results obtained. The local application of dry hot air is one of the most useful of them.

There are on the market several forms of apparatus for its application, all of which will do good work. In order to be efficient an apparatus must be capable of producing 400 degrees Fahrenheit in fifteen minutes at the outside, and of maintaining this temperature indefinitely. In order to be useful to the general practitioner these machines must also be easily portable. They may be heated by gas, gasoline, alcohol, or electricity.

Preparation of the patient for the application is simple, consisting merely in covering the part of the body to be treated with three thicknesses of loose-meshed Turkish toweling, so as to secure intimate contact between wrapping and skin. If the perspiration which is induced as soon as the heat strikes the skin is allowed to remain on the skin during treatment, it will soon boil under the influence of the intense heat and blister the patient. These wrappings absorb it as soon as it is formed, the heat immediately vaporizes it and it rapidly diffuses itself out of the wrapping.

Directions for the general operation of the machines are furnished by the manufacturers. Complete treatises on thermotherapy can be obtained by those who take more than a passing interest in it.

The physiologic effect of the dry hot air application is produced in two ways: first, by thermic irritation of the numerous nerve-endings in the skin and, second, by the actual raising of the temperature of those portions of the body in immediate contact with the heat.

Irritation of the nerve-endings of the skin results, by reflex action, in (1) marked dilatation of the capillary

areas, hence greatly increased blood supply; (2) enormously increased function of the sweat glands, hence increased local elimination, and (3) acceleration of the cell nutrition and function through reflex stimulation of the spinal centers. The raising of the temperature, *en masse*, results in acceleration of the chemical reactions constituting the cell metabolism of the part. It will be observed that the combination of these influences results in increased physiologic resistance of the tissues affected and acceleration of the process of repair of damaged tissue elements.

The sphere of action of this application, then, is in the treatment of pathologic conditions which are strictly local in character, and which can be happily influenced by increasing the local physiologic cell resistance and the local nutritional, absorptive, and eliminative functions. Such conditions obtain in many diseases encountered by the general practitioner, but it will suffice to mention two which illustrate the different types of cases in which the local dry hot air application is most useful. These are sprains and most cases of true rheumatism in which but one or two joints are involved.

#### SPRAINS

In an uncomplicated sprain the lesion consists simply of an injury of the soft tissues about the affected joint, accompanied by severe pain probably due to congestive irritation of lacerated nerve fibers. The therapeutic indications are (1) to relieve pain, (2) so to influence the trophic functions as to secure the quickest possible repair, and (3) to promote absorption of the exudate.

If a sprain is put under treatment by this agent within three or four hours after the injury has been sustained, the pain will be relieved within half an hour, and all traces of the trouble will usually have disappeared within forty-eight hours. If the case is three or four days old, however, and exudate is present to any great extent, complete removal of the disability may require from two to three weeks; but the pain is usually susceptible of the same immediate relief as in early cases.



Among other conditions in which the local application of hot air is more or less useful are pleurisy, acute gout, synovitis, fibrous ankylosis, some cases of neuritis, varicose ulcers, and sluggish healing processes not due to malignant, tuberculous or syphilitic infection.

### HYDROTHERAPY

The rôle of baths and hot and cold applications in the treatment of disease has frequently been mentioned in the preceding articles.

Hydrotherapeutic measures of various kinds are valuable in the treatment of all mental disturbances. Many water treatments are very soothing, and every sanatorium and asylum for the care of the insane should be equipped for giving hydrotherapeutic treatment.

### WATER BY MOUTH

Water by mouth should be urged in definite quantities fixed by the physician. It is an excellent diuretic. When urging water, under various conditions, the amount of urine passed in twenty-four hours and the specific gravity of the twenty-four hours' output should be known, as well as the less frequently omitted examinations for albumin and sugar. If the urine were more frequently examined during simple acute processes the profession would be surprised at the frequency with which disturbances of the kidney functions are found. Too frequently, when an insufficient amount of urine is passed, more or less irritant diuretics are given when simply an increased amount of water is needed.

A caution should be noted here, that with real nephritis, or with an insufficiency of the heart, or a failure of the circulation, or when there is edema, large amounts of water should not be drunk. On the other hand, in conditions in which water should be administered both as a diuretic and to dilute all the excretions, it is not sufficient for the physician to direct a patient to "drink plenty of water," but he should specify the amount of water he wishes taken during the twenty-four hours.

Especially is it necessary, during acute infective processes in children, to urge their drinking plenty of water, perhaps as lemonade, orangeade, or barley water; but water in some form should be freely given.

#### CABINET BATHS

Cabinet baths are used in various toxemias to encourage elimination through the skin. Where there is marked physical deterioration, advanced circulatory or cardiorenal disease, they should be given with caution.

This treatment should be given by trained attendants who can interpret physical symptoms. Medicinal stimulants should be close at hand, an ice cap applied to the head, and water given freely during the time of sweating. Perspiration usually becomes profuse at the expiration of about ten minutes, and the patients should immediately receive a cold shower in order to avoid catching cold. Cabinets should be well protected, all heat pipes or frame work properly protected, and doors to the cabinets should be such that they can be opened quickly. The neck should be well covered, and a large towel should enclose the patient's lower body in order that the procedure may be done as modestly as possible.

#### CONTINUOUS BATHS

The continuous bath is usually a warm bath, which does not drop below 88 or exceed 100 F. It can be used in cases of depression as well as in marked excitement. Aside from the therapeutic effect it seems to have a moral influence over certain incorrigible patients. Incorrigibility itself is not an indication. The bath may be administered in several forms; tubs may have separate regulators, but preferably, one central stand should be the control. Patients may be given the freedom of the bath or they may be restrained, depending on the nature of the case as well as on the therapeutic result desired. A bath of short duration at frequent intervals has more advantages than a prolonged bath of days or weeks.

The contraindications are, first, the tub baths should not be prescribed for cases with marked physical deterioration, or in wasting or advanced diseases or in

skin diseases; second, cabinet sweats are contraindicated in cases in which there is great excitement as well as serious physical disease.

#### HYDROTHERAPY IN UROLOGY

Martin (*Jour. A. M. A.*, Jan. 9, 1915, p. 102) discussed various hydrotherapeutic measures of value in urology.

Frequent applications of short fomentations, either hot or cold, cold compresses, or hot or cold immersions, he finds constitute a valuable adjunct to any treatment in combating infections. Patients with acute specific urethritis experience relief and more speedy cure by immersing the penis in alternate hot and cold water several times a day, as an adjunct to regular treatment.

#### THE SITZ BATH

A hydriatic measure frequently prescribed by urologists is the sitz. If the proper technic is followed it has a marked analgesic effect. Patients, when taking their own treatment, find the relief so gratifying that they may remain in it too long, resulting in an atonic reaction that is more or less debilitating. When used for its analgesic properties for calculus colic this relaxed effect is desirable, but not when combating chronic congestions or infections. "The best effect is obtained from a short hot sitz, from 115 to 120 F., for five to eight minutes, followed by a short cold dip or affusion, the reaction of which prolongs the primary tonic effect of the heat, by producing a tonic dilatation of the peripheral vessels, and a more active circulation. A hot sitz should always be followed by a cold sitz when treating chronic infections." In private homes, Martin suggests the effect can be obtained in a measure by gradually cooling the water or dashing cold water on the parts from a bucket. In cases of chronic infections, the advantage of such a bath is augmented by preceding it with alternate hot and cold sprays and ascending perineal douches.

Martin emphasizes the value of the prolonged cold sitz. He noted that gynecologists use it effectively in the palliative treatment of uterine fibroid, with chronic congestion accompanied by menorrhagia. "They have

demonstrated," he says, "by experience that the reaction following cold sitz baths increases the circulation in the uterus, which aggravates the menorrhagia, but prolonged (from twenty to thirty minutes at 60 to 70 F.), produces continued contraction of the pelvic and abdominal viscera, with a relief of congestion following. The prolonged active stimulation of the vasomotors exhausts them, thus losing their power to react, so that the primary effect of the cold is continued after the bath. Much of the benefit derived by the patient from this measure is due to the contraction and tone to relaxed intestinal viscera, which noticeably increases their activity and thus stimulates nutrition and intestinal elimination." This measure has proved valuable in the palliative treatment of prostatic hypertrophies with congestion, malignant growths with hemorrhages, atonic dilated bladders (especially following prostatectomies) and in sexual debility.

Care should be exercised at the start. Weak and debilitated patients should not be given the prolonged cold baths until their ability to react is established. This is accomplished by gradually reducing the temperature and extending the time from day to day. Reaction can be facilitated by a simultaneous hot foot bath, and especially by vigorous friction to parts immersed. Chilling is prevented by protection of the shoulders with flannel. The cold sitz should be preceded by a hot rectal irrigation, and followed by a spray. It is positively contraindicated in all cases of vesical tenesmus.

The neutral sitz, taken with water at 92 to 95 F. for from fifteen to thirty minutes, Martin finds valuable, because of its soothing and sedative effect in all irritable conditions accompanied by priapisms or erotomania.

Another useful measure, which can be utilized by patients at home, is the heating pelvic pack. A piece of linen, flannel and mackintosh, shaped and applied like an infant's napkin, is used as a heating compress to any other part by wringing the linen out of ice water and applying next to the skin, covered by flannel and mackintosh. Its action produces dilatation of super-



ficial vessels, with relief of internal congestions. It possesses a decided value in the relief of pain and for activating the circulation in cases of cystitis, prostatitis, epididymitis, and similar complaints. It is a valuable after-treatment following a sitz or hot fomentation, and is best employed at night.

General measures, such as packs and electric light baths, and tonic measures, as hot and cold applications to the spine, salt glows and general hot and cold sprays, are valuable in stimulating general vital tone. With their proper use, weak, anemic and debilitated patients, who may be suffering from some condition demanding radical treatment, and unable to stand it, may often be built up. Combinations of these applications, graduated as the patient's ability to react indicates, are effective in many cases of acute and chronic infections.

The routine use of the hip and leg pack followed by cold-mitten friction after surgical procedures is sometimes a valuable measure to abort shock and pulmonary congestions. These are conveniently given by the use of the electric thermaphore pack, which is placed on the bed and the current turned on before the patient returns from the operating room. The patient is thus put at once in a warm pack, which is folded around the legs and hips and heated by the electric current for ten or twelve minutes. A cold-mitten rub completes the treatment.

## GRUELS AND STARCHY DRINKS

The food value of a starchy drink during certain illnesses is considerable; also, many thin cereal liquids are very soothing to patients with gastro-intestinal disturbances. With seriously ill patients a happy arrangement of a mixed diet of some milk, some beef juice, and some thin, digestible, well-cooked starch makes the most appropriate food.

The following suggestions of the way such nutritious drinks should be prepared are from "Practical Dietetics," by Alida F. Pattee. For convenience, an approximate estimate of the calorific value has been added to each receipt.

## FLOUR GRUEL

Milk .....	1 cup
Flour .....	$\frac{1}{2}$ tablespoonful
Salt .....	1 speck
Raisins .....	1 dozen

Scald the milk, mix the flour with a little cold milk and stir into the scalding milk. Cook in a double boiler for one-half hour or on back of stove in saucepan. Stone and quarter the raisins, then add water enough to cover; cook slowly until the water has all boiled away; add to gruel just before serving, or eat with the raisins as desired. If there is much diarrhea the raisins should be left out.

Energy value approximately 150 calories.

## BARLEY GRUEL

Barley flour .....	2 tablespoonfuls
Milk, scalded.....	1 quart
Salt.	

Blend the barley flour with a little cold milk and stir into the scalding milk. Cook in a double boiler two hours, salt to taste, and add sugar if desired; strain.

Energy value approximately 650 calories.

## BARLEY GRUEL WITH BROTH

Beef broth.....	2 cups
Barley flour .....	2 tablespoonfuls
Cold water .....	2 tablespoonfuls
Salt .....	1 saltspoonful

Mix barley flour and salt with the cold water, to form a smooth paste. Add gradually to the boiling stock and boil one-half hour. Strain and serve very hot.

## ARROWROOT GRUEL

Arrowroot .....	2 teaspoonfuls
Cold water.....	2 tablespoonfuls
Boiling water or milk.....	1 cup
Sugar, lemon juice, wine or brandy as required.	

Blend the arrowroot and cold water to a smooth paste, add boiling water or milk and cook in a double boiler for two hours. Add salt, strain, and serve hot.

Both the barley and arrowroot may be administered in diarrhea.

Energy value approximately 150 calories.

#### INDIAN MEAL GRUEL

Indian meal.....	1 tablespoonful
Flour .....	$\frac{1}{2}$ tablespoonful
Salt .....	$\frac{1}{4}$ teaspoonful
Cold water .....	2 tablespoonfuls
Boiling water .....	$1\frac{1}{2}$ cups
Milk or cream.	

Blend the meal, flour and salt with the cold water to make a smooth paste and stir into the boiling water. Boil on back of stove one and one-half hours, dilute with milk or cream, strain.

Energy value approximately 250 calories.

#### RICE GRUEL

Rice flour .....	1 tablespoonful
Cold water .....	2 tablespoonfuls
Boiling water .....	1 quart
Salt.	

Mix the rice flour with a little cold water, to form a smooth paste, add the boiling water, and cook in a double boiler until transparent and thoroughly cooked. Add salt to taste, sweeten, and add milk if desired; strain.

Energy value approximately 40 calories.

#### OATMEAL GRUEL

Coarse meal .....	$\frac{1}{4}$ cup
Salt .....	$\frac{1}{2}$ teaspoonful
Boiling water.....	$1\frac{1}{2}$ cups
Milk or cream.	

Add oatmeal and salt to the boiling water, cook four or five hours in a double boiler, adding more water if necessary. Strain, and dilute with hot milk to make it of the right consistency. Heat and serve. Sugar may be added if desired.

Energy value approximately 150 calories a cup.

## FARINA GRUEL

Farina .....	1 tablespoonful
Cold water.....	1 tablespoonful
Boiling water .....	1 cup
Scalded milk .....	1 cup
Salt.	

Mix the farina with the cold water, add to the boiling water and boil thirty minutes. Add the scalded milk, taste and season properly. A little sugar may be added if desired, or an egg may be beaten and the gruel added to it.

Energy value approximately 150 calories.

## BROWNE FLOUR GRUEL

Tie one-fourth pound of wheat flour into a thick cloth and boil it in a quart of water for three hours. Remove the cloth and expose the flour to the air, or heat it until it is hard. Grate from it when wanted a tablespoonful, put into half pint of new milk, and stir over the fire until it comes to a boil, add a pinch of salt and a tablespoonful of cold water, and serve. This gruel is excellent for children with simple diarrhea.

## BARLEY WATER

Pearl barley.....	1½ tablespoonfuls
Cold water .....	1 quart
Salt .....	enough

Wash the barley, add cold water, and let it soak several hours; drain and add the fresh cold water, boiling gently (over direct heat for two hours) down to one pint, adding water from time to time; salt to taste, and strain through muslin. Cream or milk may be added, or lemon juice and sugar. This makes a demulcent drink, slightly constipating.

## RICE WATER

Rice .....	2 tablespoonfuls
Cold water .....	1 pint
Boiling water or hot milk.....	enough
Salt .....	enough

The carefully washed and cleaned rice should be added to the cold water and cooked an hour, or until the rice is tender. Strain, and dilute with the boiling water or hot milk to the desired consistency, and



season with salt. Sugar or cinnamon may be added if desired or advisable.

## OATMEAL WATER

Oatmeal .....	1 tablespoonful
Cold water .....	1 tablespoonful
Salt .....	a little
Boiling water .....	1 quart

Mix the oatmeal and cold water, add the salt, and stir into the boiling water. Boil three hours, adding water as it boils away. Strain through a fine sieve or cheesecloth, season, and serve cold.

## TOAST WATER

Stale bread, toasted .....	1 cup
Boiling water .....	1 cup
Salt .....	enough

Dry in an oven thin inch squares of the bread until crisp and brown. Take a cupful of this toast broken into crumbs, add water, and let it stand one hour. Strain through cheesecloth, season, and serve hot or cold. If desirable, milk or cream and sugar may be added.

## ALBUMINOUS DRINKS

## EGG BROTH

Yolk of egg .....	1
Sugar .....	1 tablespoonful
Salt .....	1 speck
Hot milk .....	1 cup

After beating the egg, add the sugar and salt, and then pour on the hot milk.

Energy value approximately 230 calories.

## ALBUMINIZED MILK

Milk .....	1 cup
White of egg .....	1
Salt .....	
Flavoring .....	

Place the milk and egg in a covered glass fruit jar, shake until thoroughly blended, salt and flavor as desired. Strain and serve immediately.

Energy value approximately 150 calories.

## BRAN BREAD

Wheat flour .....	2 cups
Graham flour .....	2 cups
Bran flour .....	2 cups
Salt .....	1 teaspoonful
Sugar .....	$\frac{1}{2}$ cup
Baking powder .....	1 teaspoonful
Milk .....	2 cups
Molasses .....	1 cup
Egg .....	1
Soda .....	2 teaspoonfuls
Hot water .....	$\frac{1}{4}$ cup
Raisins .....	1 cup

Thoroughly mix the foregoing liquid and solid ingredients, and bake in a moderate oven for one hour. This makes two loaves.

# MISCELLANEOUS

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## ANESTHESIA

### ESSENTIALS OF SAFE ANESTHESIA

Before commencing the administration of the anesthetic, the anesthetist should give careful attention (1) to the operating room; (2) to the emergency table; (3) to the patient.

The *operating-room* must be warm, and the operating table as comfortable as possible for the patient. There must be plenty of blankets. The legs and arms, a low pillow for the patient's head, and a pillow for the back, should all be arranged to be as comfortable and warm as possible without, of course, interfering with the exigencies of the particular operation. It is advisable to have a strong, well-working faradic battery, an oxygen tank (it should be remembered that Professor Henderson thinks too much oxygen in ether shock is inadvisable, and even advises carbon dioxid gas), transfusion apparatus, and warm, aseptic physiologic saline solution.

The articles on the *emergency table* should comprise:

1. Chloroform.
2. Ether.
3. Petrolatum.
4. Boric acid eye-drops (1 per cent.).
5. Tongue forceps.
6. Long forceps for swabbing, and properly made gauze or cotton pledgets (no ravelings), or pieces of sponge.
7. A mouth gag, or cork, or a piece of rubber.
8. A large needle threaded with strong silk.
9. A pus basin.
10. Towels.
11. Two hypodermic syringes.
12. Atropin sulphate tablets—each  $1/200$  of a grain. (The amount is small, but the dose may be repeated, if needed.)

13. Strychnin sulphate tablets — each  $1/40$  of a grain. (The amount is small, but the dose may be repeated, if needed.)

14. Ampoules of saturated solution of camphor in sterile olive oil.

15. Ampoules of aseptic ergot.

16. Epinephrin and pituitary solution in aseptic ampoules—1:10,000.

*The Patient:*

1. A twenty-four hours specimen of urine should, if possible, have been examined; certainly a single specimen should have been examined.

2. The condition of the heart and arteries should have been examined and the best anesthetic selected.

3. The patient should have received no solid food for a number of hours before the operation. If the operation is done early in the morning, it is best, three hours before the operation, to give either a cup of hot bouillon or a cup of black coffee.

4. The bowels should have been properly moved, generally by the aid of some cathartic, and often an enema is advisable at least an hour before the operation.

5. The urine should have been passed immediately before the administration of ether is begun.

6. False teeth should be removed. The nose, throat, mouth and teeth should be cleansed with an antiseptic wash. Hairpins should be removed, if the patient is a female, and the hair should be properly bound up under a cap; it is better that this cap is not made air tight as the head is likely to become very moist with perspiration, if the cap is impervious.

7. The face should be anointed with petrolatum as the vapor of ether is irritant to the skin.

8. The rate of the pulse and the feel of the radial and temporal arteries should be noted before the anesthetic is begun.

DUTIES OF THE ANESTHETIST

The anesthetist should be someone who is especially fitted for this work. He should devote his entire attention to the anesthesia, and his attention should



not be diverted from his own work to the operation, or for any other purpose. He should make himself aware of the condition of the heart by holding the index finger of one hand over the temporal artery where it passes over the zygomatic process in front of the ear. He can be aware of the condition of the respiration either by the rise and fall of the chest or by noting the exhalation of the air through the mask.

Next to the pulse and respiration, the pupil of the eye is the most important index of the condition of the patient. Sudden dilatation of the pupil, especially if accompanied by hiccough, is a grave symptom, and should indicate the immediate suspension of the anesthesia and the withdrawal of the ether.

In order to determine when anesthesia is complete many separate the eyelids and touch the conjunctiva with the tip of the finger. This is a dangerous practice and should not be followed, as the eye may be injured or infected.

A most useful test for determining complete anesthesia is raising the arm. If this falls without any muscular contraction, the anesthesia is complete. This condition may be present shortly after the administration of the ether is commenced, the so-called primary anesthesia, which may be followed by a brief return of muscular activity. The continued administration of the ether will soon produce complete anesthesia. If the operation is an abdominal one, a little ether poured on the abdomen will soon show, by reflex action from the cold, whether the patient is thoroughly anesthetized or not. Also, manipulations of any kind in the region to be operated on will often awaken an incompletely anesthetized patient when other signs have apparently pointed to complete anesthesia.

The patient should be kept as lightly under the influence of the anesthetic as is possible. Very deep anesthesia should be avoided. The anesthesia should be as brief as possible, but this, of course, rests with the operator. As soon as an operation is completed, the ether should be withdrawn. Often this can be done before the final stitches are inserted and the dressing applied. If the patient has not been too deeply anesthetized, he should begin to regain consciousness shortly after the withdrawal of the ether.

## NAUSEA AND VOMITING

One of the most troublesome of the sequelae of the administration of ether is nausea and vomiting. The exact cause of this has not been determined definitely. Some have believed that it was due to the irritation of the mucous membrane of the stomach from the ether swallowed, but this is probably not so, at least in all cases. Various methods have been proposed to combat this disagreeable symptom. All are more or less successful. If morphin has been administered before the operation, nausea apparently does not occur as soon as when it has not been administered. It is often advisable to give an injection of morphin and atropin directly after the patient comes out of the anesthesia, that he may not suffer pain and shock from such pain. Such an injection prevents the nausea, at least for a number of hours. Hot water, administered frequently in teaspoonful doses, is often a successful, simple treatment. If mucus and gas are eructated, or actually vomited, large draughts of hot water should be taken, that the stomach may be thoroughly washed out by vomiting, or by the liquid passing the irritant onward into the bowel. Some surgeons believe in washing out the stomach. This is not often advisable, but is indicated if bile is regurgitated, or if blood is extravasated into the stomach. Oxygen inhalations have been suggested. Pure olive oil, in ounce doses, has also been found useful in this condition. Of course, the oil would soothe the stomach, and would be especially sedative, if there was an increased amount of hydrochloric acid present in the stomach.

## BLADDER AND KIDNEYS

A not infrequent sequence of the administration of ether is an irritable bladder and more or less local congestion. This is shown by a slight albuminuria and by a diminished amount of urine. Such an irritation may be caused not only by the ether itself, but also by the profuse sweating and the small amount of fluid which has been ingested, causing the urine to become very concentrated and therefore irritant. To avoid such irritation, it is often good treatment, before operation, to inject a pint of hot water, with or with-

out salt (a physiologic saline solution), into the colon. Such liquid is rapidly absorbed and dilutes the urine and all the secretions and increases the excretion of urine. Such frequent irritation of the kidneys makes it inadvisable, unless there is positive necessity to administer ether a second time to the same person within so short a period as a week. In fact, it has been shown that serious kidney congestion can occur following an ether or chloroform narcosis several weeks subsequent to an anesthesia. This tendency to irritate the kidneys makes ether an anesthetic generally contraindicated when there is kidney disturbance, especially if there is any acute inflammation present.

To hasten the elimination of ether from the system, plenty of fresh air should be allowed in the room, provided it is sufficiently warm. The patient, under any circumstances, must be surrounded with hot-water bottles and blankets so that he may not lose too much heat, or better, may even acquire heat, during the shocked condition subsequent to anesthesia.

#### SALINES

If much blood has been lost and the patient is in a condition of collapse, besides administering physiologic saline solution by the rectum, intravenous or subcutaneous transfusions of saline solutions are often advisable. Raising the foot of the bed should also not be forgotten in this condition. It may be here parenthetically stated that when the Trendelenburg position has been long used in an operation the return of the patient to a level should be brought about gradually, lest anemia of the brain be caused.

#### LUNG COMPLICATIONS

Another untoward effect is sometimes the development of a pneumonia. It has been proved that either ether, chloroform, or alcohol diminishes the resistance of the cells to bacteria. Pneumonia is more apt to supervene when the narcosis has been deep and protracted. Many believe that it is also encouraged by the inhalation of cold air with the ether, and it also undoubtedly happens that the development of pneumonia is promoted by the exposure of the patient, while

under the influence of the anesthetic, by allowing the coverings to slip off from his body and limbs, or by allowing him to lie in coverings or clothing saturated with blood or with fluids used during the operation. It is exceedingly important that a patient under an anesthetic should be kept warm and dry. Various devices have been designed for keeping the patient warm by appliances connected with the operating table. These are often useful, but caution should be exercised lest the patient, while unconscious, should be burned by such appliances.

As just stated, pulmonary congestion and post-operative pneumonia are frequent serious occurrences after prolonged anesthesia, especially after prolonged etherization. Various factors have been assigned an influence in the etiology of these pulmonary conditions. Among others, it has been alleged that probably the chilling of the respiratory organs by the evaporation of the anesthetic has an important part. It has been observed that anesthetics seemed to act better in warm climates and in warm weather. From these observations it has been deduced that if the anesthetic is warmed before it is administered, there will be less danger of pulmonary sequelae. During the last ten or fifteen years many anesthetists have insisted on having the anesthetic itself, or the vapor, warmed before it is inhaled by the patient. This may be accomplished in various ways. For ordinary use, the warming of the can of ether or the bottle of chloroform to about the temperature of the body would seem to be most desirable. The inhalation of an anesthetic at this temperature results in less irritation in the throat at the beginning of anesthesia, the early accession of complete anesthesia, less of the anesthetic is needed, and hence fewer after effects.

Many patients complain of backache after an operation. This is probably due in many cases to straining of the muscles of the back on account of the back not being properly supported while the patient is unconscious. In order to avoid this a small pillow should always be placed under the lumbar region of the patient while he is on the operating table.



The question frequently arises whether to anesthetize a patient in the operating room and on the operating table, or in an adjoining room. With reference to this it should be urged that the less a patient is moved about after the administration of the anesthetic is commenced, the better. On the other hand, a nervous patient should generally be anesthetized in an adjoining room, and if possible, on a stretcher or rolling table, so that he may be transferred to the operating room and then to the operating table with the least possible general disturbance.

#### CONTRAINDICATIONS OF ETHER

Ether is contraindicated if there is present disease either of the lungs or kidneys. Other contraindications to the use of ether are chronic alcoholism, aneurysm, very high blood pressure, and an atheromatous condition of the arteries.

#### DISINFECTION

The control of infectious diseases is inseparably connected with disinfection. The rational use of disinfection began with the growth of our knowledge of bacteriology. "To disinfect," says Hasseltine (*Pub. Health Reports*, 1915, xxx, p. 2049), "is to free from infectious or contagious matter; to make innocuous. To fumigate is to apply smoke, gas or vapor." He therefore considers as disinfecting measures those which attack the specific cause of disease; as fumigating measures those which by the use of smoke, gas or vapor, attack the specific cause indirectly through the destruction of intermediate hosts or carriers, other than man, such as mosquitoes, rats, fleas, flies, etc.

#### USE OF DISINFECTANTS DURING THE COURSE OF DISEASE

If disinfection is properly carried out at the bedside the need of much terminal disinfection is obviated. The secretions and excretions which the patient gives off are the source of infection through the virulent organisms contained in them. Although it is unnecessary to disinfect all discharges in some diseases, it is better to err on the safe side and to disinfect all of them.

Sputum, nasal and other discharges should be received on cheap cloths and then incinerated. Solutions containing 5 per cent. phenol, 1 per cent. tricresol and compound cresol solution are efficient disinfectants. For feces and urine, about one gallon of boiling water may be added to a stool, which is then covered and allowed to stand until cool. Better still, however, is the following method devised by Prausnitz. A small amount of hot water is added to the stool, then fresh quicklime. The process of slaking raises the temperature and maintains it above the thermal death point of most organisms.

Bath water is easily disinfected by the addition of crude carbolic acid.

Soiled bedding and clothing are best disinfected by removal to a steam disinfecting chamber. Where this is unavailable, immersion in boiling water for five minutes, or in 5 per cent. phenol solution for several hours is efficient.

Mattresses, if infected, can be disinfected only by steam under pressure. Otherwise they should be burned.

Such articles as leather, morocco, or india rubber, furs, books and similar objects may be disinfected by long continued dry heat, 120 C. for an hour. Unless they are of considerable value, however, it is better to burn them.

#### LIQUID DISINFECTANTS

*Mercuric Chlorid.*—The solutions of mercuric chlorid are extremely poisonous. Frequent poisoning has made their use in the home undesirable unless carefully guarded. Tablets are now prepared colored, threaded, in odd shapes, and put up in various ingenious warning packages. In strength of 1:1,000 it destroys practically all organisms; 1:500 kills spore-bearing bacteria. Solutions are corrosive to metal containers. The following mixture, which contains mercuric chlorid in a strength of 1:1,000, is recommended by Parkes:

Mercuric chlorid .. . . . . .	½ ounce
Hydrochloric acid .. . . . . .	1 ounce
Anilin blue dye .. . . . . .	1 grain
Water .. . . . . .	3 gallons

*Phenols.*—This group, of which carbolic acid is the one most widely known, forms the basis of most commercial disinfectants. A 5 per cent. solution of carbolic acid is usually employed.

*Copper Sulphate.*—In 5 per cent. solution this salt acts as a strong disinfecting agent and through its power to absorb ammonia and hydrogen sulphid, it is a good deodorant.

*Zinc Chlorid.*—A 10 per cent. solution of zinc chlorid to which a little hydrochloric acid has been added is used for spore-forming bacteria. A 5 per cent. solution suffices for other organisms. Its action in general resembles that of copper sulphate.

*Potassium Permanganate.*—The solutions of potassium permanganate stain everything with which they come in contact. At least a 5 per cent. solution is required for killing most organisms. The drug is a rather expensive one.

*Chlorid of Lime.*—This substance has been mentioned for use in disinfecting stools. It is important that the large masses of the stool be broken up, in order that the lime have a chance to act on the organisms. Not less than a 1.5 per cent. solution of the powder (about  $2\frac{1}{4}$  ounces to the gallon) should be employed.

*Formaldehyd.*—This substance is used chiefly as liquor formaldehydi, about 40 per cent. strength. It is chiefly used for its power to produce a disinfecting gas.

#### TERMINAL DISINFECTION

With reference to the more common infectious diseases, such as diphtheria, scarlet fever and measles, some authorities believe that terminal disinfection is unnecessary. Their claim is based on the belief that conditions are unfavorable for the multiplication of organisms outside the body and that such organisms die shortly after their removal from animal tissue. The handbook of the Bureau of Infectious Diseases of the New York Department of Health says that "in diphtheria and measles, when a patient recovers the sick room is thoroughly cleaned and aired."

Cleansing is a good method of terminal disinfection. The floors and wood work, all mouldings, ledges and window casements should be scrubbed. A vacuum cleaner may be applied to the walls and ceiling, if such an apparatus is available. After cleaning, renovation, including painting, renewal of wall paper and calceining is a valuable measure.

Wherever there is doubt as to the thoroughness with which cleansing and renovation are accomplished, as well as bedside disinfection, and wherever possible without too great inconvenience, terminal fumigation should be done. Hasseltine recommends in combating disease carried by animal hosts, fumigation with sulphur dioxide. The best results, he suggests, are obtained by fumigating all rooms of the structure simultaneously. Five pounds of sulphur per 1,000 cubic feet are sufficient, and should be placed in a thin layer so as to burn rapidly. If fumigating only to destroy vermin, moisture is not necessary. Exposure of four to twelve hours is desirable.

In those diseases that are apparently non-insect borne and communicable, formaldehyde may be used. This should always be properly applied. It should be used at a temperature of 65 F. or higher, and with a relative humidity of 65 per cent. at the beginning of the process. Humidity and the required temperature may be obtained by boiling water in the room. If possible, all the gas liberated should be confined to the room fumigated. The following method devised by Dixon is a good one for the liberation of formaldehyde gas.

Briefly, the procedure is as follows: Ten ounces of liquor formaldehyde and 5 ounces of potassium permanganate are sufficient for 1,000 cubic feet of space. A large receptacle should be used, to avoid spattering, and this should be placed on a noncombustible surface. If there be not sufficient moisture present there will be some danger of the dry gas igniting. Several receptacles in different parts of the room are more effective than one large container. The permanganate is placed in the container and the formaldehyde poured over it. The reaction is shown by ebullition of the fluid, slight or marked according to its temperature. When once started it continues until all available formaldehyde has been liberated.



In New York City, this method is modified by using 75 gms. of permanganate in 90 c.c. of water, hot if possible; then 30 gms. of paraformaldehyd are added. This is sufficient for 1,000 cubic feet. This method makes less weight to carry, as the water is obtained at the place where disinfection is to be done. The paraformaldehyd is more stable than formaldehyd solution, the latter seldom containing the required 40 per cent.

Dixon reported favorable results by substituting sodium dichromate and sulphuric acid for potassium permanganate. The acid and formaldehyd solution are mixed and allowed to cool. This solution is then poured over the crystals of sodium dichromate, spread in a thin layer in a large container. The mixture is:

Sodium dichromate .....	oz	10
Saturated solution formaldehyd gas....	pint	1
Sulphuric acid, commercial.....	oz	1.5

## ANAPHYLAXIS—ALLERGY

### PROTEIN POISONING

The fact that bacteria could cause protein poisoning was first noted and the condition described, in 1903, by Victor C. Vaughan of Ann Arbor. Protein poisoning is the cause of most urticarial conditions, of many of the skin eruptions, of many of the simple, so-called febricula (a name applied to a fever lasting one or two days with no positive diagnosis determinable), and all of these disturbances are really forms of allergy.

Some protein poisons may cause a lowered or sub-normal temperature, rather than fever. This is apparently due to a marked dilatation of the peripheral blood vessels, especially of the splanchnic area, similar to that in shock. With other protein poisonings there may be, for several days, an irregular temperature with morning remissions. If such poisonings persist and the toxins are not rapidly expelled, neutralized or destroyed, there will be an increased elimination of nitrogen and a progressive loss of weight.

The symptoms of many diseases are due to the so-called "parenteral" ingestion of proteins. Hay-fever and paroxysms of asthma are caused in sensitive individuals by the pollen of different plants, the emanations

from different animals, or the dust or odors of many kinds of substances. Any susceptible individual may be sensitized, so to speak, by one or more of these irritant causes and not by others. The inhalation of some substances in almost intangible amounts may cause serious inflammation of the upper air passages and even of the bronchial tubes.

Many drugs taken internally may sensitize individuals who have peculiar idiosyncrasies against them, and may cause, primarily, gastric and duodenal irritation, and secondarily, disturbances similar to protein poisoning (such as urticaria and swelling of the mucous membranes), which may become serious, as occasionally seen with quinin, salicylates, antipyrin and the coal-tar products. Many of the so-called genito-urinary stimulants of the copaiba class may cause considerable irritation and eruption of the skin.

As indicated by Cooke (*Jour. A. M. A.* 73:759, 1919), Coca's classification of hypersensitiveness into "anaphylaxis" and "allergy" will serve to clarify this whole field, which has been confused by the attempt to explain natural and artificial hypersensitiveness on the same basis.

Anaphylaxis is an antigen antibody reaction, artificially induced by immunologic processes. Allergy is used to express the natural hypersensitiveness of the individual not produced by immunologic processes, as the exciting agents or allergens are in many cases not capable of producing antibodies. For example, the natural hypersensitiveness of the human being to pollens, the clinical reaction to which is known as hay-fever, is admittedly allergic. In experiments carried on with Coca and Flood, Cooke and Vender Veer could not demonstrate antibody in the individual during an attack or after injection of pollen extract by passive transfer; nor could antibody be produced in the guinea-pig itself. In other words, the extract is nonantigenic. Other substances, such as glue and certain drugs like acetylsalicylic acid, to which individuals react peculiarly, are also nonantigenic. To be sure, many of the substances to which the human being does show clinical hypersensitiveness are capable of forming antibodies. Hence the confusion between the natural hypersensitiveness or allergy and the artificial or anaphylaxis.

Living bacterial cells, like other living cells, must form ferments to prepare their food for absorption. Consequently, as described by Vaughan, for a given bacterium to be poisonous to the human animal, for instance, it must have the ability to split up and feed on the proteins of the human being; otherwise bacteria cannot grow and cannot harm the host. Another prerequisite to such poisonings is that the ferments in man must not be immediately destructive to the invading bacterium, although ultimately antibodies may be formed in sufficient quantities to destroy it. A bacterium, then, able to digest the proteins in man renders this host susceptible to its poisoning unless he has been previously protected, either by a previous infection from the specific bacterium or by a previous inoculation or vaccination with the germ or its products which so promotes the formation of antibodies or anti-ferments that it renders the individual immune. This is the scientific basis of vaccination and protective inoculation.

The value of vaccine treatment is due to the fact that the general system is not producing ferments sufficient to eradicate the special bacterium and its poison, and the inoculation so stimulates the general production of antibodies or ferments that the local disease is stopped and later eradicated. On the other hand, if a person is suffering from a general poisoning or infection, such vaccines are of doubtful value or may be actually harmful by over stimulating the already worn-out antagonistic cells, and the individual is thus really injured by such vaccination; therefore the frequent and careless use of vaccines is deplorable and often inexcusable.

If proteins are naturally digested in the stomach and intestines and are absorbed only as the molecular forms that normally reach the blood, no sensitizing or anaphylaxis or intoxication will occur. If, however, the proteins are absorbed before they reach their final disintegration stages and are then digested parenterally (that is, outside of the intestine), or if they reach the blood through other channels or are injected directly into the tissues, such poisoning or "reaction" occurs, attended by more or less fever, nervous irritability, increase in

the number of the white corpuscles, changes in the blood plasma, kidney irritation, and frequently diarrhea. The system, however, soon produces active or immune bodies to combat the specific ferment.

#### DEFINITION

By the word "anaphylaxis" is understood generally the more severe phenomena that appear when an animal previously influenced (sensitized) by a foreign protein, introduced into the blood and tissues by injection or otherwise, after a suitable interval again receives the same protein into its blood and tissues as the result of injection or otherwise. Anaphylactic shock in the guinea-pig injected for experimental purposes is the classical example. As these phenomena are regarded currently as the result of an intoxication with the products of protein splitting, anaphylaxis may be looked on as a protein intoxication occurring when a prepared animal receives the proper protein into its system.

At first the word anaphylaxis was used to describe the condition in which severe, violent phenomena occur on reintroduction of toxic proteins (eel serum, actinea poison) in animals previously injected with these substances for purposes of immunization. This was contrary to expectation; the previous injections, it had been assumed, would produce a condition of protection—a prophylaxis; as the directly opposite action resulted, the word anaphylaxis, meaning the reverse of prophylaxis, was coined to designate the condition. Before long, hypersusceptibility was introduced as synonymous with anaphylaxis. As a clearer insight into the nature of the condition was gained, especially through the work of von Pirquet on serum disease in man, it developed that in reality the reverse of prophylaxis or hypersusceptibility to poisonous substances is not concerned, but a change in the powers of the body to react on the introduction of foreign proteins. In order to indicate the nature of this conception, von Pirquet coined the word "allergy," which means altered reactivity. Novy and DeKrinf have coined the word "taraxy" from the Greek word meaning "a disturbance." The anaphylactic protein poison, also called



the allergic substance, and the anaphylotoxin they would call "taraxin," i.e., the disturbing substance. At present there seems to be general agreement that phenomena as different as the experimental anaphylactic shock in guinea-pigs, the various manifestations, mild and severe, of serum disease in man, various "food idiosyncrasies," such as egg asthma, poisoning by cow's milk, etc., and the tuberculin and similar reactions are all due to an altered reactivity of the body, altered by previous influence of the foreign proteins concerned on the antibody-producing tissues.

### MANIFESTATIONS

The length of time before the occurrence of hypersensitiveness or sensitization varies; the poisoning may be acute, as in so-called "ptomaine poisoning" or in that which occurs from some such toxin as is found in toadstools; or it may require a number of days for the person affected to be sensitized. Sensitization from a serum injection or from the absorption of some protein irritant may not happen until after a series of days, perhaps a week, and this sensitization will often not be recognized until a second injection (the intoxicating dose) of the same serum is administered, or until more of the same protein poison is absorbed, when reaction becomes evident and is sometimes serious in its outcome. Therefore, it cannot be too carefully noted that injection of prophylactic or antitoxic serums should ordinarily not be repeated too long after the first injection has been given. This is not always true of all antitoxins or all bacterins, but it is more or less constantly in evidence. Sometimes the system becomes tolerant to this irritant, and a larger dose, given to obtain a desired reaction, will be borne. In other instances the patient becomes hypersensitive, and the repetition of a previously harmless dose may cause an intense reaction. This has occurred with diphtheria antitoxin a number of times, and would occur with any horse serum in patients who are susceptible to, and are always hypersensitized by, emanations or dust from horses.

Persons peculiarly susceptible to horse serum may develop bronchial edema and severe symptoms within

a few minutes or hours after an injection of diphtheria antitoxin; or, in certain instances, they may not develop the asthma, urticaria, joint pains and fever until after a series of days. Such late symptoms are not generally dangerous, although albumin may appear in the urine, but generally the kidneys rapidly recover and all the symptoms disappear. Other persons may have an intense local reaction to an injection of antitoxin or vaccine out of all proportion to the injury caused and later may show some of the general symptoms. Such cases are very troublesome and more or less serious, but rarely cause death.

When antitoxin is indicated in diphtheria, or horse serum in hemorrhage, one should be sure to inquire whether or not the patient is an asthmatic or a sufferer from hay-fever, and especially if horse emanations cause either of these conditions. A preliminary injection of a small dose, perhaps just a few minims beneath the skin, will indicate whether there is a marked susceptibility. This phase of the subject has been fully discussed under the subject of antitoxin in diphtheria.

This reaction of the blood, that is, anaphylaxis, to different poisons, seems to be the cause not only of the symptoms which follow vaccination against smallpox, typhoid fever and other diseases or infections, but also of the symptoms of hay-fever induced by different pollens, varieties of dust or odors. It is the cause of asthma in many persons, of the urticaria produced in susceptible individuals by shellfish, buckwheat or strawberries, and of the symptoms of sensitization or anaphylaxis which sometimes occur even from such ordinary foods as veal, pork, eggs, some kinds of cheese and milk.

It seems also, with our great knowledge of this blood disturbance, that quite probably the skin eruptions of the exanthems, of typhoid fever, and even of primary syphilis may be due to this hypersensitizing of the blood by the proteins of the specific bacteria. Our recognition of the anaphylactic temperature caused by serums and toxins suggests that the fever process of the various infections may also be due to the protein poisoning caused by the germ of infection.

## TREATMENT

Discussion of the treatment of these specific sensitivities would lead us astray, but the symptoms attributed to the poisoning protein in the blood are more or less the same, namely, fever, irritation of the central nervous system, cutaneous irritability and perhaps eruption, more or less muscle pains and concentration of the urine with kidney irritation, lumbar backache, and either constipation or a diarrhea that shows bowel irritation without complete evacuation. In some instances vomiting is present, especially in children, and headache is frequent or constant, dependent on whether the absorption of the poison is intermittent or continuous.

Whatever the infection or irritant that causes these symptoms may be, the general treatment is the same, namely, whatever of the poison is still in the intestine should, if possible, be removed by a free, non-irritating catharsis by castor oil, calomel, or a saline, as advisable. It is quite possible that more of certain kinds of intestinal poisons may be absorbed under the influence of an oil than would be if a saline is administered. If it is a poison to which the patient is susceptible, he certainly should receive no more of the irritating food. If the disturbance is due to the proteins of some specific germ, he should receive only such nutriment as is easily digested, and therefore less likely to furnish incompletely disintegrated protein products for absorption, thus to add more irritants to the already disturbed blood. Consequently, individual idiosyncrasies should be learned and the signs of indigestion noted; the foods that probably will digest most readily and are not too rich in proteins are the only ones that the patient should be allowed.

Novy and DeKruif on the basis of extensive studies have advocated the administration of sodium bicarbonate or, preferably, sodium acetate in large doses—from 3 to 5 gm. dissolved in a half glass of water—in the treatment of chronic sensitivity. These doses are given at intervals of from one-half hour to an hour during the day. The object of this treatment is to raise the alkalinity of the blood to a maximum and to sustain this degree of alkalinity. It is also advised

as a prophylactic in patients with a tendency to eclampsia or to food reaction of any kind. As recommended under the treatment of syphilis, the injection of large doses of alkali before giving a dose of arsphenamin (salvarsan) may be of service in preventing a reaction to this drug.

The next object is to dilute the poison already in the blood by the administration of large amounts of water, perhaps medicated, acidulated, alkalized, carbonated or plain, as seems indicated. The greater the amount of urine passed, and the freer the perspiration, the sooner, in all probability, will the toxins be eliminated, unless they are produced in overwhelming quantities.

The skin should be frequently soothed with warm water (often best made alkaline with sodium bicarbonate) sponging and then powdering with a simple bland powder, such as starch. An irritated, erupted skin should not be sponged with alcohol, which dries the skin and will cause more irritation. The more moisture there is in a skin with an urticarial or exanthematous eruption, the less is the irritation and itching. The temperature is also more rapidly reduced by evaporation. If the fever is excessively high and must be reduced, of course the usual hydrotherapeutic measures should be inaugurated.

#### CALCIUM

The nutritional value of calcium and its necessary participation in many functions of the body is described under that head. The relationship of diminished calcium content of the blood to some angioneurotic edemas and to some of the urticaria-like localized swellings and edemas, has been shown by investigators. It seems to be a clinical fact in many cases that these exudates and symptoms of anaphylaxis are prevented, or are quickly improved, by the administration of calcium. Experimental evidence as to the value of calcium in preventing anaphylaxis is rather contradictory.

#### DRUGS WHICH CAUSE ERUPTIONS

Urticarias, erythemas and scarlatiniform eruptions may be caused by belladonna, salicylic acid and arsenic or any of their salts or preparations; by antitoxin,



many of the volatile oils and drugs containing them (as copaiba, santal oil, turpentine); by some of the synthetic compounds (as antipyrin, sulphonal, etc.); by chloral, quinin and its salts, and by opium and many of its alkaloids or preparations. These eruptions appear in some patients after a single therapeutic dose of any of these drugs; in others only when the drug is pushed, or when it has been given for some time. The frequency of idiosyncrasy against these drugs follows about the order in which they are named. Arsenic will rarely cause an eruption, unless it is pushed to full physiologic action. Some patients acquire a drug tolerance and no subsequent eruptions occur after the first dose or two. This is typically true of some persons who are susceptible to quinin.

Unless the drug is being pushed to full physiologic action with a definite object, or a tolerance is expected and desired or the discomfort is unimportant, the drug should be stopped, a cathartic given, and soothing, bland mucous membrane sedatives should be administered, such as bismuth subcarbonate, sodium bicarbonate, milk of magnesia or slippery elm or flax-seed infusions. Even milk and starch water are sometimes very efficient sedatives to the mucous membrane of the stomach and upper intestine, if it has been irritated by a drug. Of course, it is possible that the drug has caused anaphylaxis and the irritant is already in the blood. Then the treatment consists of large amounts of water, a bland diet, alkalies such as potassium citrate, large doses of sodium bicarbonate, and perhaps calcium in some form.

Bromids and iodids frequently cause skin eruptions, occasionally after the first dose, but generally after a series of doses. An eruption quite generally occurs if these drugs are at all continuously given. Some patients, like epileptics or syphilitics, who are given large doses of bromids and iodids for a long time, become tolerant and do not have the skin eruptions, unless the dosage is very large. The iodid eruption is likely to be papular, but is rarely pustular. The bromid eruption is papular and frequently pustular, and the bromids may cause serious skin eruptions. It is sometimes thought that when arsenic is given coincident-

ally with bromids this troublesome eruption is less likely to occur. It also should be remembered that if sodium chlorid is removed from or greatly reduced in the diet of the patient, such large amounts of bromids as were once given are unnecessary. Therefore, the eruption is less likely to occur. The iodids cause eruptions less often than the bromids. The eruption from either drug rarely causes itching, but it takes some time for the eruption to disappear, even when the drugs have been discontinued.

The treatment of these eruptions is to stop the drugs, if possible, to cause thorough bowel elimination, to give hot baths or body bakes or electric light baths, and massages, as all tend to promote a more healthy condition of the skin. In fact, the bromid eruptions are less likely to occur if the skin is frequently cleansed and massaged during administration of large doses of the drug.

#### VACCINE THERAPY

"If at the present time ten years of public notoriety have passed over any doctrine professing to be of importance in medical science, and if it has not succeeded in raising up a powerful body of able, learned, and ingenious advocates for its claims, the fault must be in the doctrine and not in the medical profession." This old criterion of Holmes, says Leake (*Jour. A. M. A.* 71: 631, 1917), is applicable to bacterial vaccine therapy, for though Fraenkel's work dates back almost three decades and Wright's eighteen years, in this country it was not until about thirteen years ago that any great degree of notoriety attached to the subject. The profession generally was about to grant vaccine therapy, at least autogenous vaccines, a more or less definite place when the new mass of data regarding nonspecific reactions began to appear and to cause grave doubts as to what were formerly regarded as fundamental principles.

In this consideration the use of vaccines in prophylaxis will not be considered. Against typhoid they are undoubtedly efficacious; in whooping cough they have some value, and in a few other instances they are of doubtful efficacy.

It is the general impression that a well prepared autogenous vaccine is superior to a stock vaccine in securing effective results. On the other hand, commercial laboratories holding federal licenses and manufacturing stock vaccines, claim for their products superiority as to sterility and content of preservative, and less likelihood of containing toxic protein products. For the autogenous vaccine it may be argued that there are numerous individual strains of bacteria and therefore autogenous vaccines possess greater specificity. At the same time, it has been argued that the entire effects are now specific and due to the reaction created by the injection of foreign bacterial protein.

#### NEED FOR CONTROL OBSERVATIONS

As indicated by Leake, the literature abounds with observations on this form of therapy, but the vaccine was administered for the most part without controls. It is obvious that the tendency is to report favorable results, while the series of unsuccessful cases are less likely to be published. In some very excellent experiments in which the injections of vaccines were used on some patients treated side by side with others who did not receive vaccines, and covering typhoid fever (Whittington), pertussis, (Von Sholly), and influenza, (McCoy), it was shown that the vaccine treated cases did no better and in some instances did worse than those not receiving vaccines. Furthermore, Billings, who studied many cases of chronic arthritis, reported that a personal and general hygienic management did quite as much without as with vaccines; and that when such management is neglected and treatment left to vaccines alone, the patients are harmed. This view may seem pessimistic, yet it is based on a review of an extensive literature which was found to be marked primarily by a "will-to-believe" rather than a critical judgment.

#### AUTOGENOUS VACCINES

Autogenous vaccines are prepared from bacteria isolated from the patient who is to receive the vaccine. "Assuming that we have a case which clinically is suitable for treatment by active immunization," says Irons, "we may inquire what preparation of bacteria will be

most efficient in stimulating the inactive forces of immunity. The researches of recent years indicate that one of the chief elements in the chronicity of an infectious process is a change in the infecting organism by which it becomes less susceptible to the attack of the forces of immunity of the host, and that this bacterial resistance or 'fastness' may be as important as the deficiency in the formation of antibodies of the host. Another similar change in the infecting organism, the acquirement of 'organ specificity' by which through long sojourn in a particular organ of an animal, or series of animals, the invader develops a special aggressiveness for that organ, must also be reckoned with. If artificial active immunization is to be effective, it should take cognizance of all, or of as many of these elements as possible, and hence a vaccine should be derived from any organism possessing the properties of those concerned in the infectious process—an autogenous vaccine."

#### STOCK VACCINES

Stock vaccines are suspensions of killed bacteria in salt solution, oil (lipovaccines) or water, usually with a small amount of preservative, phenol or tricresol.

#### MIXED VACCINES

Mixed vaccines are made by securing all the micro-organisms present in a secretion or in a material, or by mixing stock vaccines in various combinations. Their value is questionable. It has been said that the resort to mixed vaccines, particularly to mixed stock vaccines, is either a confession of ignorance of the exact nature of the infection and misapprehension of the principles of immunity or an evidence of indifference and laziness on the part of the physician using them. It were more advisable to use a known unmixed stock vaccine, a carefully studied polyvalent vaccine, or a single purified protein. As a rule, some one organism plays a predominant rôle in an infectious process. In some cases, as in sinus infection complicated by arthritis or mastoiditis, two or more organisms may be associated in producing the disease condition. When this etiologic association has been determined by actual bacteriologic



examination a mixture of two vaccines may be tried provided vaccines are at all indicated. Unless based on preliminary bacteriologic examination, the method is irrational.

#### DATING OF PRODUCTS

Federal regulations require that each package of biologic products be stamped with an expiration date "beyond which the contents cannot be expected beyond reasonable doubt to yield their specific result." Such products should be kept in cold storage.

#### THERAPEUTIC USE OF VACCINES

Woolley says that infectious processes in general are suitable for treatment by active immunization (1) if they are localized, i. e., confined to one or more isolated lesions and not associated with bacteriemia; (2) if they are more or less chronic. Based on a study of the literature he concludes with Moody (*Jour. A. M. A.* 74: 391, 1920) that autogenous vaccines seem to be useful in the following infectious disorders:

1. Furunculosis and localized abscesses in soft tissues.
2. Acne vulgaris.
3. Colon bacillus pyelitis and cystitis.
4. Chronic gonorrhea and gonorrheal rheumatism.
5. Chronic bronchitis.
6. Bronchial asthma of bacterial origin.

Vaccines seem to be of little or no value, he says, in:

1. Infection of bone or infections in cavities with rigid walls.
2. Infection of the intestinal tract.
3. Infection of the uterus and adnexa.

Vaccines are contraindicated in:

1. Acute infections and infectious diseases.
2. Septicemia and pyemia in the acute stages.
3. Malignant endocarditis.

Moody has also outlined the following rules: Begin with a dose small enough to avoid a generalized reaction, and gradually increase this dose to the point at which perhaps only a slight local reaction occurs. At first one may give the injections every day to determine what is the proper dose for the patient being treated. When this point is determined, one should continue to give increasing doses at three or four day intervals

until one is giving at each injection not more than one billion organisms. Massive doses of killed organisms are likely to be quite toxic and produce harmful rather than beneficial results. As a matter of fact, under such conditions it is possible to lower greatly the normal resistance of the person treated.

It must be remembered also that the body cells of persons with acute infections are quite sensitive to foreign protein injections. This is important, and physicians using vaccine therapy should bear it in mind and treat such patients with caution.

In prophylactic immunization, especially against typhoid, persons with chronic malaria, tuberculosis, bronchitis, nephritis, etc., are quite likely to react so severely to the ordinary injection that harmful results not infrequently follow.

## VACCINATION AGAINST SMALLPOX

### THE KIND OF VACCINE TO USE AND HOW TO USE IT

The United States Public Health Service, in Public Health Reports for November, 1917, advises the following procedure in order to secure the best results from vaccination and to prevent possible complications.

#### I. THE VACCINE

The freshest possible vaccine should be obtained. All vaccine packages, pending use, should be kept in a metal box in actual contact with ice.

#### II. THE VACCINATION

Vaccination should never be performed by cross scratching or scarification, but by one of the methods described below. If a prompt "take" is very necessary, as in case of direct exposure to smallpox or if the first attempt has been unsuccessful, three or four applications of the virus should be made, but the insertions should be at least an inch apart. Whichever method is used, a control area may be first treated similarly, but without the virus, in order to estimate the amount of pressure necessary for insertion and in order to demonstrate a possible early immune reaction in previously vaccinated individuals.

*Preparation.*—The skin of the upper arm, in the region of the depression formed by the insertion of the deltoid muscle, should be thoroughly cleansed with soap and water if not seen to be clean, and in any case with alcohol or ether on sterile gauze.

After evaporation of the alcohol or ether, a drop of the virus should be placed on the cleansed skin. To expel the virus from a capillary tube, the tube should be pushed through the small rubber bulb which accompanies it, wiped with alcohol, and one end broken off with sterile gauze; the other end may be broken inside the rubber bulb. The hole in the latter should be closed with the finger as the bulb is compressed to expel the virus.

The under surface of the arm is grasped with the vaccinator's left hand so as to stretch the skin where the virus has been placed. The skin is kept thus stretched throughout the process.

*Methods.*—(a) The Method of Incision, or Linear Abrasion: By means of a sterilized needle or other suitable instrument, held in the right hand, a scratch, not deep enough to draw blood, is made through the drop of virus, one-quarter inch long and parallel with the humerus. The virus is then gently rubbed in with the side of the needle or other smooth, sterile instrument. Some blood-tinged serum may ooze through the abrasion as the virus is rubbed in, but this should not be sufficient to wash the virus out of the wound.

(b) The Drill Method: A sterile drill, such as is used for the von Pirquet cutaneous tuberculin test, shaped like a very small screw driver with a moderately sharp end not more than 2 mm. wide, is held between the thumb and middle finger, and with a twisting motion and moderately firm pressure, a small circular abrasion, the diameter of the drill, is made through the drop of virus; this should draw no blood.

(c) The Multiple Puncture Method: A sterilized needle is held nearly parallel with the skin, and the point pressed through the drop of virus so as to make about six oblique pricks or shallow punctures, through the epidermis to the cutis, but not deep enough to

draw blood. The punctures should be confined to an area not more than one-eighth inch in diameter.

With Methods *a* and *b* it is advisable to expose the arm after vaccination to the open air, but not to direct sunlight, for fifteen minutes before the clothing is allowed to touch it. With Method *c* the virus may be wiped off immediately.

### III. THE VACCINATION WOUND

1. The original vaccination wound should be made as small as possible, and all injury to the vaccinated arm should be guarded against. Any covering which is tight, or more than temporary, tends to macerate the tissues during the "take." This is to be avoided. No shield or other dressing should be applied at the time of vaccination. Customary bathing and daily washing of the skin may be continued, so long as the crust does not break. The application of moisture to the vaccinated area should not be enough to soften the crust.

If an early reaction of immunity is to be watched for, the patient should report on the first, second, fifth and seventh days after vaccination. Otherwise, the patient should report on the ninth day, or sooner if the vesicle, pustule or crust breaks. Every effort should be made to prevent such rupture. However, should the vesicle, pustule or crust break, and the wound thus become open, daily moist dressings with some active antiseptic, such as mercuric chlorid or dilute iodine (one part tincture of iodine in nine parts of water) should be applied. Under no circumstances should any dressing be allowed to remain on a vaccination wound longer than twenty-four hours, and no dressing should be applied so long as the natural protection is intact.

On account of possible fouling by perspiration and to lessen the chance of exposure to street dust, primary vaccination should be performed preferably in cool weather. In order to encourage proper surgical treatment, no charge should be made for the after-care of a vaccination, or for revaccination in case the first attempt should prove unsuccessful.

Although apparently trivial, vaccination is an operation which demands skill in performance and care in



after-treatment in order to avoid the rare, but serious, complications. For the prevention of these complications vaccination (*a*) should be performed with strictly aseptic technic, (*b*) should cover the smallest possible area for each insertion, and (*c*) should be treated without any covering which permits maceration.

A child should be vaccinated by the time it has reached the age of 6 months, and the operation should be repeated at about 6 years of age and whenever an epidemic of smallpox is present.

### TRANSFUSION OF BLOOD

The idea of introducing healthy blood into the circulation of a person threatened with death either from chronic disease or from some acute accident is not a new one. As far back as 1667 Denis conceived the idea of blood transfer and used it successfully in a human being. Early it became evident that there were certain objections to the introduction of the blood of lower animals into man, and the practice fell into disuse. During the last century experiments were made on the direct transference of blood from one person to another. This was attempted by means of rather complicated apparatus and under certain handicaps which now may be avoided. The earlier attempts of this sort were made before the days of perfect aseptic technic, and infection sometimes followed the operation of transfusion. Recently, because of an increased interest in the possibilities of transfusion, there have been published descriptions and results of several new methods. These methods tend to the elimination of those factors that are responsible for untoward symptoms following transfusion. With a knowledge of the processes concerned in coagulation, and also with the perfection of simple and reliable methods for testing the properties of the blood plasma and red blood corpuscles, unfavorable results, due to the infusion of the blood itself, are uncommon. Transfusion in the hands of a trained and experienced operator is fraught with little or no danger to either the donor or the recipient of the blood. This fact has led investigators to experiment on many different types of disease in which previously it would not have been deemed advisable to transfuse.

When transfusions were first attempted, and even up to recent years, little thought was given to the possibility of severe reactions or symptoms. These do not occur in more than 10 per cent. of the transfused cases. Some of these are trivial and do not last long; others, however, may be of a serious nature. Some of the symptoms resemble those seen in serum sickness, with a rise in temperature, chills, and the appearance of an urticarial rash. Others are of an anaphylactic character, accompanied by shock. However, with properly conducted tests, it may be stated that there need be no fatal cases traceable to the transfusion itself.

Whatever untoward symptoms or fatal cases occur as a result of the transfusion may be traced to some disturbing element in the introduced blood; to the formation of a thrombus; to the introduction of an embolus, or to the dilation of an already weakened heart by too large an injection of blood or by a too great pressure exerted in the introduction of the blood. The introduced blood may have the property of agglutinating or hemolyzing the blood of the patient. Recently, Satterlee and Hooker have suggested three possibilities: (1) a disturbed trypsin-antitrypsin balance in the recipient's blood resulting in the formation of a serotoxin; (2) the disturbance of the protective colloids in the body cells of the recipient, exposing them to a reaction of antigen and antibody in the circulation of the recipient, and (3) a toxic disturbance resulting from incipient coagulative changes produced by physical influences arising during the process of the transfusion (*Jour. A. M. A.*, Feb. 26, 1916, p. 618).

Agglutination and hemolysis can be avoided by preliminary tests, mixing the donor's corpuscles with the receptor's serum and vice versa. Infusion of syphilitic blood must be prevented by a complement-fixation test of the blood of the donor. The problem of eliminating any other disturbing factors in the blood is still one to be investigated. Although several anticoagulants have been suggested for the prevention of coagulation, so far only two have been advocated, herudin (an extract of leech) and sodium citrate, and of these the sodium citrate has been shown to be the safer and more reliable. It has been found that herudin preparations,

particularly those which have been prepared for some time, undergo a certain amount of chemical change with the production of a toxic substance. Sodium citrate, on the other hand, has been used very successfully with no, or but very few, untoward effects.

#### METHODS

Transfusion methods may be divided into two kinds, the direct and the indirect. By the direct methods are meant those in which the artery of the donor and the vein of the recipient, or the veins of each, are brought into contact either by being sutured or by being connected with a tube or with a cannula. Carrell was perhaps the first to suture the vessels together, and although this method has been successful in some cases, nevertheless it has the disadvantage that it is too time-consuming, and that the amount of blood passing from donor to recipient cannot be measured. This can also be said of most direct methods. Time is consumed in dissecting out sufficient lengths of the vessels so that they can be easily handled. For the purpose of preventing clotting of blood during its passage, when the cannula or straight tube is used, these are treated with sterile paraffin or albolene. These substances work admirably.

The cannula method described by Crile is typical of other cannula methods. He uses a cannula through which he draws the proximal end of the divided vein and then turns back the end of the vein like a cuff over the end of the cannula. Over this he then draws the proximal end of the divided artery. The radial artery of the donor and the median basilic or cephalic of the recipient are used. This is rendered comparatively easy by having the patients lie beside each other, but with their feet in opposite directions. This operation brings into contact the intima of the artery with the intima of the vein and this greatly minimizes the liability to clotting of the blood.

Transfusion by means of a connecting tube is described by Vincent. This consists in the use of glass tubes which are used to connect the vein of the recipient with the artery of the donor. These tubes

are usually from 3 to 8 cm. in length. In order to avoid clotting, the tubes are coated with various preparations, such as liquid petroleum, petrolatum, stearin or paraffin. It was found that petrolatum made too soft a covering, and stearin too hard and rough a covering. A mixture of petrolatum, paraffin and stearin in 2:2:1 proportions gives the smoothest and a sufficiently hard covering. It was also found that the blood ran very well in plain glass tubes, so that they might be used with a fair chance of success if it were not practicable to use the coated tubes. (*Am. Jour. Dis. Child.*, May, 1911, p. 376.)

Probably the first indirect method was the use of defibrinated blood, the fibrin having been removed after whipping up the blood. This method, on account of the possibility of infection and red blood and platelet destruction, was given up. In 1913, Lindeman announced a simple method of transfusion which did not necessitate cutting down on and dissecting out the vessels of the donor and recipient. Other advantages of the method were that it could be carried out rapidly, and that the amount of blood used could be accurately measured. Lindeman's method consists of the use of several record syringes, each with a capacity of 20 c.c. Two operators are required, and special cannulas are used. After the donor and recipient have been placed in recumbent positions, the veins to be used are selected. As a rule the median basilic is the vein of choice. In infants the external jugular is better on account of its large size and easy accessibility. A tourniquet is placed around the arm of the recipient, the skin sterilized, and the cannula inserted into the vein. The tourniquet is removed, and to avoid escape of blood, a syringe filled with sterile saline solution is attached to the cannula until ready for use. The arm of the donor is treated in a similar manner, with the tourniquet above the site of puncture. After this has been done, the syringes are rapidly filled with blood from the donor's vein and injected through the cannula into the vein of the recipient. To prevent clotting, after each injection of blood a little sterile saline solution is injected into the cannula in the recipient's vein. Before a syringe is used a second time, it must be cleansed with sterile water. Dexterity and speed are



necessary. Other advantages in this method are that both arms of the donor can be used at the same time, and that there is no permanent injury to the blood vessels. The same vein can be used repeatedly for other transfusions. In 155 cases in which a total of 136,800 c.c. of blood was transfused, there was not one death referable to the transfusion. The adults received from 1,000 to 1,800 c.c. at each transfusion.

The Lindeman method, however, was open to several objections. These were the constant connecting and disconnecting of the syringe, namely, inability to gage the force with which the blood was injected each time and the risk of clotting, inasmuch as the blood was exposed to the air when the syringes were disconnected. It also required the services of two operators both expert in the handling of the syringes.

To obviate these objectionable features, Unger (*Jour. A. M. A.*, Feb. 13, 1915, p. 582) devised an apparatus with a central stopcock arrangement, the stopcock of which could be arranged so that the blood drawn out from the vein of the donor with a 20 c.c. syringe could be injected into the vein of the recipient with the same syringe. Needles or cannulas are inserted into the veins of both donor and recipient as in the Lindeman method, and these are connected with the apparatus. Only one syringe is required for this, and at no time is the blood exposed to the air. Another feature of the apparatus is that the passages traversed by the blood can be kept clean by flushing them occasionally with sterile saline solution by means of another syringe attachment. Very good results without secondary symptoms have been reported with Unger's apparatus. A similar shuttle apparatus was designed by Miller of Brooklyn. In fact, the various types of blood transfusion apparatus all have commendable and condemnable features. Any good instrument house can display four or five types among which the physician may make a choice.

#### ANTICOAGULANTS

A somewhat different method of indirect transfusion is the use of blood to which has been added an anticoagulant. It has already been mentioned that the anti-

coagulants which have proved most successful are herudin and sodium citrate. Herudin, however, under certain conditions develops toxic properties which should exclude it for transfusion purposes. Sodium citrate has proved very favorable, and has some good features to commend it. One of these features is that blood may be drawn from a donor into the citrate solution and carried to another place for use. It may be kept on ice for a week and used. It does away with the usual operating room technic, and may be injected into the vein of a patient at his home.

Hustin in 1914 reported the result of a transfusion in a human being in which the blood was kept fluid by means of 0.2 per cent. sodium citrate and mixed with an equal amount of physiologic sodium chlorid solution containing glucose before injection. Weil in 1914 stated that he had successfully transfused human beings with as much as 250 c.c. of blood kept fluid by means of sodium citrate. Lewisohn shortly after described the use of 0.2 per cent. sodium citrate solution for this purpose and this has proved to be the most satisfactory method.

#### TECHNIC

Sydenstricker, Mason and Rivers have described their technic at the Johns Hopkins Hospital (*Jour. A. M. A.*, June 9, 1917, p. 1677) in some detail. The blood of the donor having previously been tested for agglutination and hemolysis with the blood of the recipient, also with the Wassermann test, his arm is cleaned and prepared as though for the injection of salvarsan and the needle is inserted into the vein. The needle is connected by a short length of pure gum rubber tubing, previously sterilized, to a right angled glass tubing which is inserted through a rubber stopper in a wide mouthed bottle of some 250 to 1,000 c.c. capacity. Through another hole in the bottle another piece of right angled tubing is placed to which is attached a rubber tubing for gentle suction should the needle become clogged. Finally through another central hole in the stopper is placed an ordinary separating glass funnel. It is, of course, understood that all of the apparatus is sterilized. It is also previously

rinsed with sterile normal salt solution. Five c.c. of 25 per cent. sodium citrate solution are allowed to run into the bottle through the separating funnel. The needle is inserted in the vein and the blood allowed to run freely into the bottle. As the blood flows in the cock of the funnel is opened wide enough to allow citrate solution to drip in at the rate of 10 c.c. for each 90 c.c. of blood. The bottle may, meanwhile, be gently agitated. The blood is then transferred directly to a sterile salvarsan apparatus and allowed to run into the median basilic vein of the recipient as in salvarsan injections. After 25 c.c. have been introduced it is well to wait to see that no reaction occurs.

Lewisohn's technic is more simple. He divides his description into two parts:

1. Obtaining the blood from the donor: A tourniquet is applied to the donor's arm, and one of the larger veins in the elbow region (usually the median cephalic vein) is punctured. A cannula of large diameter is used in order that the blood may flow out rapidly through the needle. The blood is collected in a graduated glass jar which contains at its bottom the 2 per cent. citrate solution. If we want to give 450 c.c. of blood, we add 50 c.c. of this solution, thus effecting a 2 per thousand mixture. Smaller and larger amounts of blood are treated proportionately. It is important to take good care that in mixing blood and citrate the proportion is never less than 2 per thousand. In order to prevent such an occurrence it might be advisable to add a few cubic centimeters of surplus citrate solution which can be done with perfect safety.

2. Infusion of the blood into the recipient. The recipient is usually so anemic that we have to expose the vein by a small incision in about 80 per cent. of the cases. The cannula is inserted, and the latter is attached to a salvarsan apparatus which contains from 20 to 30 c.c. of physiologic sodium chlorid solution. The blood is then poured into this apparatus and allowed to run into the punctured vein by gravitation (exactly like an ordinary saline infusion).

## DOSAGE

As recently pointed out by Unger (*Jour. A. M. A.* 73:815, 1919), with blood, as with other therapeutic measures, the amount given is a factor in determining the result. A donor can with safety supply one quarter of his blood volume. Just how much of this a patient should be given is dependent on various factors. For infants the usual dose should be from 80 to 150 c.c. For adults, from 800 to 1,000 c.c. This amount, of course, varies with the weight, the condition of the patient's heart and lungs, and the disease for which the transfusion is being performed.

Overtransfusion from the donor's standpoint is evidenced by an increase of the pulse and respiratory rates, repeated yawning or deep sighing. Changes in the rhythm of respiration may occur before a change of the pulse rate. If these symptoms appear, the transfusion should be discontinued. Pallor and sweating are occasionally followed by collapse. From these symptoms he will quickly recover if the transfusion is discontinued.

As regards the patient, hypertransfusion is more serious. This may lead him to complain of precordial distress, headache, backache, or pain in his legs. A more important sign, however, is a short, sharp cough. If the transfusion is continued, the cough will be repeated. The cough, when it does appear, occurs irrespective of the rate at which the blood was transfused. Unger emphasizes particularly that one should *not transfuse more than 200 c.c. after the first cough.*

## INDICATIONS

As technic improves and experience increases in transfusions, more and more indications for its use are being found. It is no longer used only as a last resort for life-saving purposes. It is finding its field of usefulness extended to diseases in which an influx of some new blood might hasten the progress toward improvement, or diseases in which it will tide the patient over a temporary relapse. In reviewing the results of 212 blood transfusions in 189 cases, Ottenberg and Libman (*Am. Jour. Med. Sc.*, 1915, 150, 36) mention a



large number of varied conditions in which transfusion was tried. They also discuss the results obtained in each condition. Their classification is as follows:

- I. Transfusions for simple hemorrhage.
  1. Gastric and duodenal ulcer.
  2. Dysentery.
  3. Typhoid hemorrhage.
  4. Ectopic pregnancy.
- II. Transfusions in connection with surgical operations.
  1. Preliminary to operation.
  2. For postoperative hemorrhage.
  3. For shock.
- III. Transfusions for the cure of hemorrhagic conditions.
  1. Purpura hemorrhagica.
  2. Hemophilia.
  3. Hemorrhages secondary to:
    - (a) Blood diseases.
    - (b) Severe infections.
    - (c) Jaundice (cholemia).
- IV. Transfusions for blood diseases.
  1. Pernicious anemia.
  2. Leukemia.
- V. Transfusions for infections.
  1. Infections with pyogenic organisms.
  2. Subacute streptococcus endocarditis.
- VI. Transfusions for intoxications.
  1. Acute poisoning.
  2. Diabetic coma.
- VII. Transfusions for debilitated conditions.
  1. Cancer.
  2. Malnutrition.
  3. Simple anemia.

The experience of Ottenberg and Libman in the foregoing cases was as follows:

In duodenal or gastric ulcer the hemorrhage was stopped in twelve of fourteen cases in which the conditions were desperate. The cases best adapted are those in which there has been repeated or prolonged bleeding. In acutely bleeding cases there is danger of increasing the hemorrhage through increase in blood pressure.

The dysentery cases were not so successful as to their final outcome. In four of six cases transfused, the patients died from a continuation of the dysentery.

In typhoid fever, in which nine transfusions had been performed in seven cases, two of the patients ultimately recovered. They state that "in all typhoid cases, the first appearance of blood in the stools should be an indication to make preparations so that transfusion can be done, if needed, at very short notice."

In bleeding in ectopic pregnancy, transfusion was life-saving in all of three cases transfused.

In transfusions done in connection with surgical operations, in thirty-three preoperative transfusions, thirteen patients recovered from the operation. Some of the others died from postoperative complications. They had three brilliant recoveries in five transfusions for postoperative hemorrhage. In shock, however, transfusion was disappointing.

With the hemorrhagic conditions, in nine cases of purpura hemorrhagica, six patients recovered completely. In hemophilia, in five out of six cases the hemorrhage ceased and the patients regained good health. In hemorrhage secondary to infection, in one, a case of a new-born, the hemorrhages were checked. In another with gonorrheal rheumatism, transfusion was followed by recovery, while in a third case of hemorrhagic diphtheria, the patient died.

In three cases of acute leukemia, the hemorrhages did not cease after transfusion, whereas in one chronic case it did.

Transfusions for hemorrhage in jaundice have been very disappointing, the hemorrhage persisting afterward, even in the nonmalignant cases.

The experience of Ottenberg and Libman with transfusions in pernicious anemia consisted of thirty-five transfusions in twenty-five cases. In no case was there a cure; in eleven cases no effect was observed, whereas in fourteen cases immediately following the transfusion, there were more or less prolonged remissions. They quote one case in which splenectomy was also done after the third transfusion, with a brilliant result, the patient returning to excellent health. In their summary they state that although transfusion never cures pernicious anemia, nevertheless it is the best remedy, for it leads to remissions in about half the cases.

In leukemia, the transfusion was performed in ten cases. In the acute cases, the patients did not fare well, whereas in the chronic cases of the lymphatic type there was a tendency for the blood picture to return to normal. This, however, was only temporary, as the leukemic blood picture ultimately returned.

Transfusions were also done in infectious diseases. It was done only as a last resort in some of the very desperate cases. There were ten cases, and four of these patients recovered. Three of these successful cases were osteomyelitic infections due to *Staphylococcus aureus*. The fourth case was a streptococcic infection.

In endocarditis, transfusing was resorted to to combat the anemia. There were four cases, all due to the *Streptococcus viridans*. In three of these cases there was temporary improvement, but all four patients succumbed to the disease.

Transfusion is of value in cases of poisoning due to carbon monoxid, hydrocyanic acid, benzene or nitrobenzene when the blood has been acted on by these to a marked degree. Preliminary phlebotomy, however, is very essential.

Diabetic coma offers a poor field for transfusion. In four cases in which transfusion was performed, not one patient recovered.

In debilitated conditions caused by cancer, transfusion without surgical interference is of no avail. On the other hand, it may relieve the anemia in tuberculosis. In the simple anemias due to malnutrition or other minor causes, transfusion is justified, and satisfactory results can be obtained.

In a series of fifteen cases of hemorrhagic disease of the new-born, Lespinasse transfused by the direct method, and obtained recoveries in thirteen.

More recently Unger (*Jour. A. M. A.*, Dec. 29, 1917, p. 2160) has published the results in 165 cases of blood transfusion. The indications for transfusion he states to be (1) hemorrhage; (2) diseases of the blood; (3) toxemias; (4) infections; (5) shock, and (6) general debility. The diseases in which hemorrhage was the indication are grouped: (a) gastric or duodenal ulcer; (b) typhoid fever; (c) postoperative

hemorrhage; (*d*) ectopic gestation; (*e*) uterine hemorrhage; (*f*) ulcerative colitis; (*g*) jaundice; (*h*) hemorrhage associated with blood diseases, and (*i*) miscellaneous cases, including hematemeses of unknown origin, intestinal hemorrhage of unknown origin and bleeding from multiple telangiectases. Sixty-two transfusions were done in forty-seven cases in this group. In fifteen of these cases the transfusion was undoubtedly a life-saving procedure.

The diseases of the blood include (*a*) secondary anemia; (*b*) pernicious anemia; (*c*) hemophilia; (*d*) purpura hemorrhagica; (*e*) leukemia; (*f*) bleeding of the new-born, and (*g*) miscellaneous, including Banti's disease, von Jaksch's anemia and Henoch's purpura. He concludes that transfusion is of value and to be recommended in pernicious anemia but can be expected to produce remissions in only about half of the cases. In hemophilia it can be relied on to stop the hemorrhage, but in no way to affect the course of the disease. In purpura it is much less reliable; in fact, recovery followed in only two of our six patients. In acute leukemia it is of but temporary benefit. In bleeding of the new-born it is a specific and essentially a life-saving measure.

Transfusion was done with toxemia as the indication in (*a*) pneumonia; (*b*) pyogenic infections; (*c*) illuminating gas poisoning; (*d*) morphin poisoning; (*e*) uremia; (*f*) scurvy, and (*g*) toxemia of pregnancy.

As a result of this varied experience Unger concludes:

"The best results of transfusion were obtained in hemorrhage, diseases of the blood, toxemias and shock. In 88 per cent. of the cases of acute hemorrhage, bleeding was stopped by one transfusion. In pernicious anemia, remissions can be initiated. Repeated transfusions frequently bring on repeated remissions. If no remission results, transfusion with a different donor should be performed. For the hemorrhage of hemophilia, transfusion is practically a specific. It is dangerous to delay too long with palliative measures if active bleeding is present. In purpura, transfusion gives only moderately good results. In the severe cases, it would seem advisable to carry out the suggestion



of splenectomy with preliminary transfusions. All attempts to influence acute leukemia failed. In bleeding of the new-born, transfusion is a specific. Especially in cases of melena, temporizing by using other methods is contraindicated. The median basilic vein can be used regardless of the baby's age, and is the route of choice.

"Transfusion, although employed in a comparatively small number of cases, has yielded encouraging results in toxemia associated with acute infections (e. g., pneumonia), toxemia of pregnancy, scurvy and shock. It seems to overcome shock if employed at the onset of the symptoms.

"Transfusion is often of assistance in overcoming intractable suppurative processes and causing a marked increase in the vitality of the patient. In bacteremias, it has had practically no success. It is possible, however, that if immune donors were used the results might be better. Transfusion given preliminary to an operation will often so improve the patient's condition that the surgeon is justified in risking an operation. It will prolong the life of a patient suffering with a debilitating condition.

"The syringe cannula method (requiring only one syringe) has proved a simple, efficient and dependable one for giving whole unmodified blood. The giving of unmodified blood is the method of choice when blood is required as a tissue (as in various anemias). When it is required to replenish impoverished circulation, citrated blood can serve as a substitute."

In a final report on his work, Lindeman (*Jour. A. M. A.* 73:896, 1919) has defined certain critical periods in disease when blood transfusion is especially important. In long standing cases of sepsis, in pernicious anemia, in tropical sprue, in gas poisoning, in nephritis with severe anemia, in leprosy, in aleukemic leukemia and following hemorrhage, blood transfusion may act specifically as a life saving factor in therapeutics.

#### REACTIONS TO TRANSFUSION

It has been shown by De Kreuf that blood acquires toxic properties in direct proportion to the path it has traveled toward coagulation. Pemberton (*Surg.*,

*Gynec. Obstet.* 28:262, 1918) has described a typical reaction following transfusion of incompatible blood:

The patient first complains of tingling pains shooting over the body, a fulness in the head and an oppressive feeling about the precordium, and, later, an excruciating pain localized in the lumbar region. Slowly but perceptibly the face becomes suffused, a dark red to a cyanotic hue; respirations become somewhat labored, and the pulse rate, at first slow, sometimes suddenly drops as many as 20 to 30 beats a minute. The patient may lose consciousness for a few minutes. In one half of our cases an urticarial eruption, generalized over the body, or limited to the face, appeared along with these symptoms. Later the pulse may become very rapid and thready; the skin becomes cold and clammy, and the patient's condition is indeed grave. In from fifteen minutes to an hour, a chill occurs, followed by high fever, a temperature of 103 to 105 degrees, in which the patient may become delirious. Jaundice may appear later. The macroscopic appearance of hemoglobinuria is almost constant.

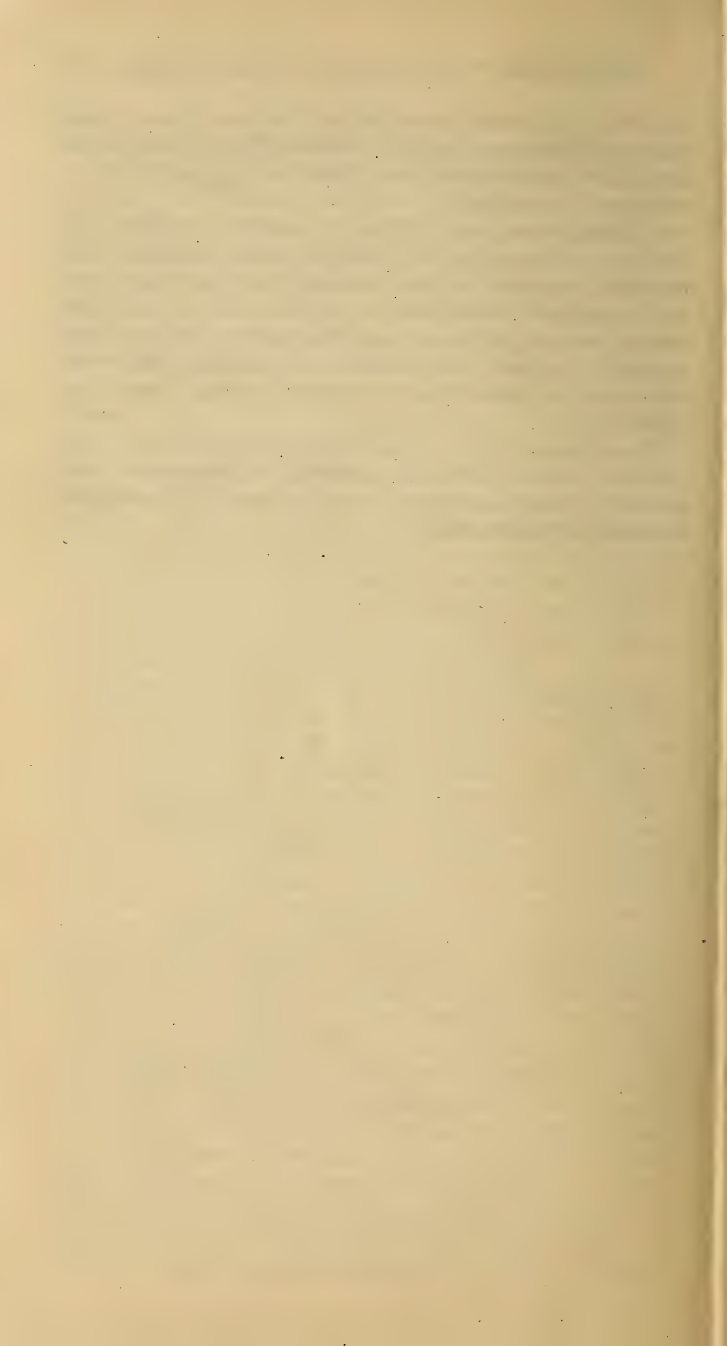
Pemberton concludes that these cases "point out most strikingly the fact that the injection of incompatible blood, namely, blood in which the donor's cells are agglutinable by the serum of the patient, is attended by the development of symptoms of the gravest nature, and that if these are not early recognized and the transfusion concluded before the injection of a large quantity of blood, fatal results are to be expected."

In the case of citrate transfusions, certain special untoward factors concerned have been made the subject of study in man by Drinker and Brittingham (*Arch. Int. Med.* 23:133, 1919) at the Harvard Medical School laboratories. They have failed to observe any constant relation between the method of citration or the purity of the citrate used and the number of reactions. The objectionable component resides in the cells of the blood; for citrated plasma, thoroughly freed from all formed elements by prolonged high speed centrifugalization or by porcelain filtration, is singularly nontoxic, contrasting markedly with serum in this regard. On the other hand, the washed whole cell content of blood is uniformly toxic, whether injected

into the individual from whom the cells have been removed (plasmapheresis) or into different individuals who have been tested and show no agglutination or hemolysis of red cells.

A further analysis of the location of the factors in the cells responsible for the difficulties indicates that reactions decrease as the platelets are removed from the transfusion mixture. The Harvard investigators report that salt solution, red cells, white cells in greatly reduced numbers, and absence of platelets make the most perfect blood for transfusion that they have observed.

Transfusion is a comparatively easy and safe procedure; it is a scientific method of treatment in a variety of conditions and its field of usefulness may be considerably extended.





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